THE EFFECT OF CONTRACT REMUNERATION ON CONSTRUCTION PROJECT PERFORMANCE FACTORS

by

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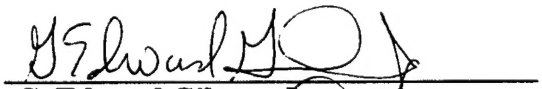
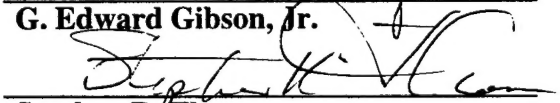


G. Edward Gibson, Jr.



Stephen R. Thomas

Dedication

I wish to dedicate this thesis to my father, Leo Anthony Nesius, for teaching me the importance of education and instilling in me the determination to see things through to their completion, no matter what kind of obstacles are encountered along the way.

I also wish to dedicate this thesis to my mother, Hilda Andrea Nesius, for encouraging me to always do my best and showing that she cared.

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Abstract

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This thesis analyzes the effect of contract remuneration type, lump sum or cost reimbursable, on various construction project performance factors. While there are many commonly held beliefs concerning contract remuneration effect on construction project performance factors, there are few studies that specifically investigate this issue. The Construction Industry Institute's Benchmarking and Metrics database contains data on 395 construction projects worth nearly 21 billion dollars and represents an excellent opportunity to conduct this research investigation. The project performance factors to be analyzed include cost growth, schedule growth, design-construction overlap on design-build projects, changes and safety. Conclusions and recommendations are presented based on the results of the analysis.

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Chapter 1: Introduction

1.1 PURPOSE

The purpose of this thesis is to determine if any relationship exists between the type of remuneration used on construction contracts and construction project performance factors for projects contained in the Construction Industry Institute's Benchmarking and Metrics Database.

A critical step in the execution of any construction project is the selection of the remuneration type to be used on the construction contract. There are many reasons why an owner would choose one remuneration type over another for a construction contract. The choice of either a lump sum or cost reimbursable contract will have a great impact on how risk is allocated between the contracting parties, to what extent the owner must be involved in the construction project, and the nature of the relationship between the contracting parties. All of these are important issues an owner must consider.

In addition to these issues is a fundamental question: Does the type of contract remuneration affect various construction project performance factors? Can a correlation be found between the choice of contract remuneration type and improved construction project performance?

This thesis will explore this question and examine what, if any, relationships exists between contract remuneration type and the construction project performance factors of cost growth, schedule growth, duration ratio for design-build projects, change orders and safety. The goal of this paper is to

identify useful relationships and develop recommendations that can be applied by the construction industry.

In addition, the performance of public sector contracts will be compared to private sector contracts to determine if there are any useful lessons that can be applied to public sector contracting, particularly that of the Naval Facilities Engineering Command.

1.2 SCOPE

The scope of this research is to examine the construction projects contained in the Construction Industry Institute's (CII) Benchmarking and Metrics Databases for 1995 and 1996. These databases will be referred to as Version 1.0 and Version 2.0, respectively. Research will focus on the Construction Phase of the various Owner and Contractor projects examined. No other data will be used for this research.

1.3 HYPOTHESES

There are many anecdotal stories or "rules of thumb" which address the effect of contract remuneration type on construction project performance factors. But there is a scarcity of actual research that specifically addresses this question or provides any documented relationships. As such, this thesis will take a conservative approach and proceed under the hypothesis that contract remuneration type has no effect on construction project performance factors. Specifically, the following hypotheses will be used:

a. Contract remuneration type has no effect on construction project cost growth.

b. Contract remuneration type has no effect on construction project schedule growth.

c. Contract remuneration type has no effect on duration ratio for design-build projects.

d. Contract remuneration type has no effect on the number of construction project changes.

e. Contract remuneration type has no effect on construction project safety.

1.4 THESIS OUTLINE

This thesis is structured in what should be a logical, easy to follow format. Chapter Two will provide some background for this thesis, including definitions of contract remuneration types, an examination of motivating factors used for choosing a specific contract remuneration type, and a summary of past research in this area. Chapter Three will detail the research methodology involved in this thesis. Chapter Four will provide analysis of the data contained in the CII Benchmarking and Metrics Database. This discussion will include a breakdown of sample demographics and the determination if any relationship exists between contract remuneration type and construction project performance factors. Chapter Five will present the conclusions reached by this research investigation.

Chapter 2: Background

The information provided in this chapter was gathered through a lengthy literature review. It discusses background on information about contract remuneration. Some basic definitions for the two primary types of contract remuneration and their variants will be provided. Possible motivations for owners to choose one type of contract remuneration over another will be explored, including strengths and weaknesses of each remuneration type. Lastly, past research conducted on the effects of contract remuneration on contract performance factors will be examined.

2.1 Contract Remuneration Types

The two basic types of contract remuneration to be examined in this research are lump sum, or fixed price, and cost reimbursable.

A lump sum contract is a guarantee by the contractor to perform the work, as specified, for a fixed price no matter what the actual price may be (The Business Roundtable Report A-7 1982). Variations of the lump sum contract include:

- Unit Price – unit costs and estimated quantities with payments based on work actually performed.
- Fixed Price with Escalation – price adjustments on cost of certain materials, labor or other factors beyond the contractor's control.
- Incentives may also be used in conjunction with a lump sum contract.

A cost reimbursable contract is an agreement by the contractor to perform the work and be reimbursed on the basis of actual costs incurred for material and labor, plus an agreed amount for the contractor's overhead and profit (The Business Roundtable Report A-7 1982). This amount is often referred to as the "fee". The variations include:

- Cost plus a Percentage Fee – the contractor's fee is a percentage of the actual project cost.
- Cost plus a Fixed Fee – a fee covering the contractor's overhead and profit is negotiated before the project commences.
- Cost plus an Incentive Fee – some or the entire fee is dependent upon achieving certain cost, schedule or other goals.
- Cost plus an Award Fee – fee varies according to certain agreed criteria which contractor is rated for performance.
- Guaranteed Maximum Price – similar to cost plus a fixed fee except that a ceiling is set for 100% cost reimbursement to the contractor. Contract clauses state that the contractor must share some percentage, usually half, of any cost overruns. Provisions may also be made for contractor to share in any cost savings below the guaranteed maximum price, again usually half.

There is some disagreement among literature sources as to whether a guaranteed maximum price contract is a lump sum or cost reimbursable contract as it is a hybrid containing elements of both. In order to maintain consistency with CII's Benchmarking and Metrics surveys, guaranteed maximum price contracts will be considered cost reimbursable.

2.2 DECISION MOTIVATORS

There are many reasons why an owner may choose one contract remuneration type over another. Public owners, such as governmental agencies, are usually limited by law to the sole use of competitively bid lump sum contracts. Private owners, however, have no such limitations and are free to choose contract remuneration type based on whatever motivators are present. To understand why an owner might choose one contract remuneration type over another, the relative strengths and weaknesses of each contract remuneration type will be examined in the areas of cost, risk, schedule, changes and owner involvement. The types of project scenarios that seem to be best suited to each type will also be discussed.

2.2.1 Lump Sum

Lump sum contracts are the most common type of contract remuneration used by owners today. They are most commonly used in association with what is referred to as the "traditional method" of contracting: A separate designer is hired to develop plans and specifications for the project. A general contractor is hired through open competition and sealed bidding. The general contractor with the lowest responsive bid is awarded a lump sum contract to perform the work (Gordon 1994). Lump sum contracts are relatively simple to use and do not require a sophisticated owner organization, which may account for their popularity.

The conditions best suited for using the traditional, or lump sum, method are a clearly defined project, well and completely designed construction documents, no need to complete the project in less time than this standard process will take, and a low likelihood of change during construction (Gordon 1994).

Cost

Contract price is always a significant issue to owners, and often it is the most important selection criterion for contract choice (Dozzi 1996). It is generally accepted that open competition, sealed bids and firm fixed price contracts are the cheapest way to award a contract (Griffis 1988). In a competitive contracting market, this is further amplified and owners may realize significant savings as contractors lower their bid prices to obtain work. If adequate competition is not present, however, there is no guarantee that a lump sum contract actually represents a fair and reasonable price for the work (Johnson 1987). One drawback to lump sum contracting is that the lowest price may not be the best overall price for a project (Dozzi 1996).

Another attractive aspect of the lump sum contract is that the cost of the contract is known at an early stage in the project. It represents a fixed investment level, except for changes (Johnson 1987). And, as stated above, the contract cost is guaranteed by the contractor, except for any changes.

Risk

There are many risks involved in construction. The primary risk concerning most owners is financial risk – the risk of what the final cost of the project will be. The type of contract remuneration used plays a key role in how

risk is allocated. With a lump sum contract, maximum risk is placed upon the contractor, who guarantees project delivery for a set price within the schedule specified. Conversely, the owner's risk is lower than with any other type of remuneration.

In exchange for placing most of the risk upon the contractor, the owner may be paying a higher price for the work. The contractor is required to consider contingencies in his bid price that may or may not happen. Most users of lump sum contracts fail to realize some risks can be less expensively borne by the owner (Gordon 1994).

Schedule

Lump sum contracts take the longest total time from project inception to completion (Smith 1975). There must be a complete definition of facilities, site working conditions, and contract scope in order for the bidders to accurately program the project and estimate its cost (Johnson 1987). This may lead to an overall later completion than with other types of remuneration and must be acceptable to the owner. Once the contract is awarded, the actual duration of construction is guaranteed by the contractor, except for any impact caused by changes. This allows start-up or move-in planning to take place at an earlier date.

Changes

A key feature of the lump sum contract is the competitive nature in which it is usually awarded. This, theoretically, ensures the lowest cost to the owner. Any change to a lump sum contract, however, requires a formal, written change order. These change orders are essentially sole source contracts and are typically

negotiated with the contractor. Contractors normally include schedule impacts and additional overhead in the price of a change order, which may make the "unit cost" of the change order more than that of the original competitively bid contract (Ironmonger 1989).

Owner Involvement

A lump sum contract requires the lowest amount of owner involvement of any contract type. The contractor is required to control all aspects of contract execution. This means the owner's project management effort is reduced and simplified. Since the contractor is responsible for delivering only what is specified in the contract, the owner's influence in matters relating to the work is lowest in lump sum contracts (Johnson 1987).

2.2.2 Cost Reimbursable

While not as widely used as lump sum contracts, particularly in the public sector, cost reimbursable contracts are used extensively in the United States. Certain conditions lend themselves to the use of cost reimbursable contracts. Projects with a high degree of uncertainty, such as new technology, demolition and renovation, and rapidly changing technology are well suited for cost reimbursable contracts. Cost reimbursable contracts are also appropriate for projects where the most rapid execution possible is required, as are projects requiring greater contractor participation in the design process (Gordon 1994). In market conditions with a shortage of contractors, the use of cost reimbursable contracts may be the only way to interest contractors in performing the work (Johnson 1987).

Cost

One of the biggest owner concerns on cost reimbursable contracts is that the initial cost of the project is not guaranteed (Griffis 1988). Beyond this concern, however, are many advantages to using cost reimbursable contracts which can result in an overall lower project cost. Owners do not pay for contractor contingencies unless they actually occur. Owners can closely control contractor procurement and subcontracts. The cost of changes is limited to actual audited costs, which are usually less than a negotiated price. Legal costs are reduced as claims are virtually eliminated and the contractor's fee may be less due to reduced risk (Griffis 1988).

Other major cost concerns are that the contractor has no incentive to control costs as on a lump sum contract, and there is a tendency for contractors to overcharge for such items as tools, equipment rental and home office personnel in order to increase his fee (Griffis 1988).

Risk

Since contract cost is not guaranteed, cost reimbursable contracts hold the most financial risk for the owner (The Business Roundtable Report A-7 1982). But an owner can reduce costs by accepting more risk where the scope of work is unclear or unknown (Ironmonger 1989). This is particularly applicable to projects involving new technology, renovation and demolition, where it is more difficult to ensure the validity of cost and schedule estimates (Belev 1989).

Schedule

Cost reimbursable contracts offer potentially the shortest project execution from inception to completion. Most are awarded through select negotiation, which eliminates lengthy bid periods. Since a complete design is not required before award, construction can start before the design is finished. This process, commonly called phasing or fast tracking, can greatly reduce the project execution duration (Ironmonger 1989).

Changes

Cost reimbursable contracts offer the owner a greater degree of flexibility than lump sum contracts with rigidly set specifications (Ibbs 1986). Changes are more easily executed as negotiations for each change are eliminated. The contractor is simply paid his actual costs for the additional work (The Business Roundtable Report A-7 1982). Thus, cost reimbursable contracts are recommended where the potential for many changes is high, as in renovation and demolition projects, or projects with rapidly changing technology.

Unlike lump sum contracts, there seems to be a natural tendency for owners to make more changes than necessary on a cost reimbursable contract, perhaps because they are easier to make. Owners must work hard to control this tendency through implementation of change approval boards to avoid unnecessary changes and keep costs down (Griffis 1988).

Owner Involvement

Cost reimbursable contracts require more and higher quality owner involvement than other types. This could pose a problem for less sophisticated owners. This increased involvement does allow the owner to exercise much closer control over project execution. The owner can more closely control procurement of major items of equipment and subcontracts. It is easier for the owner to make changes to the project. The owner also has closer control over project quality. Instead of settling for the minimum acceptable quality specified, as in a lump sum contract, the owner can opt for a higher quality standard and the contractor is willing to perform, as all costs associated with the higher quality will be reimbursed (Griffis 1988).

2.3 PAST RESEARCH

In order to develop hypotheses for this study, the results of past research uncovered during the literature review were examined. There were few actual research studies done on the effect of contract remuneration type on construction project performance factors. Most of the literature examined featured opinions based on anecdotal information, surveys that solicited qualitative responses, or the results of a single project. Two studies based on quantitative information from many projects were found and are discussed.

In 1986, a group of researchers (Ibbs et al.) at the University of Illinois conducted a study to determine the impact of various construction contract types and clauses on project performance. Thirty-six CII member companies responded to a survey and submitted results on 36 contracts completed within the previous

three years. These projects included 16 lump sum, 4 guaranteed maximum, 11 cost plus fixed fee, 3 cost plus percent fee and 2 target estimate contracts. For purposes of their study, lump sum and guaranteed maximum were grouped together as fixed price contracts and the rest fell under cost reimbursable contracts.

As part of the survey, respondents were asked to evaluate overall project performance in several categories, including cost, schedule and safety. The study participants ranked the performance of their projects as a comparison to original expectations for success and profitability. The ranks included "much worse", "worse", "expected", "better" and "much better". First, all the projects were grouped together to get an "industry average", and then broken out by contract remuneration type. The following table shows the percentage of projects ranked "better" or "much better" for the categories of cost, schedule and safety performance:

Table 1: Project Performance Ratings (Better or Much Better Than Expected)

Category	**Fixed Price**	**Cost Reimbursable**	**"Industry Average"**
Cost	50%	69%	59%
Schedule	30%	55%	41%
Safety	40%	53%	47%

The respondents in this survey indicated that cost reimbursable contracts performed better in the areas of cost, schedule and safety than fixed price contracts from a qualitative perspective.

The researchers then examined several commonly accepted "truths" derived from an extensive literature review. Tests were developed to statistically verify these statements so as to validate the construction industry's perceptions of the advantages and disadvantages of various contract types. One hypothesis of interest to this study states that cost reimbursable contracts assist in minimizing the schedule while fixed price contracts minimize costs. The researchers approached the first part of this hypothesis from the view that cost reimbursable contracts allow the commencement of construction before the design is complete. To test this hypothesis, the researchers used their survey data to determine if there was significant overlap of the design and construction periods for the cost reimbursable projects. To do this, the sum of design duration and construction duration was divided by the total duration from start of design to construction completion. This was referred to as the "duration ratio"

The data showed, with a 95 percent confidence level, that there was more overlap of design and construction on cost reimbursable contracts and thus an opportunity to potentially reduce total project duration. As to the second part of the hypothesis, the researchers felt the database provided no opportunity for statistical analysis of whether fixed price contracts do in fact minimize costs when compared to cost reimbursable contracts.

Dwight R. Johnson, an executive at Exxon, conducted analysis on cost performance of "hundreds" of past projects at that company, both lump sum and cost reimbursable (Johnson 1987). Figure 1 is a plot of actual cost performance of the two types of contract as compared to Exxon's own cost estimate. The cost reimbursable contracts, with a few exceptions, demonstrate a cost performance close to the base estimate levels. Lump sum contracts, however, performed well below estimated levels during three major periods on the time plot. These periods are described by Johnson as "lump sum markets", which featured competitive market conditions. During "hard" market conditions, which tend to favor the contractors, lump sum contracts performed near estimated levels and major savings were not available.

2.4 SUMMARY

This chapter discussed the two primary types of contract remuneration used in construction contracts, lump sum and cost reimbursable, and their main variations. It also examined the different factors that motivate owners to choose one type of contract remuneration over another. Those factors are cost, risk, schedule, changes and owner involvement. Finally, it examined two past research projects and their findings on the effects of contract remuneration type on selected contract performance factors. The next chapter will discuss the research methodology used to conduct the research in this investigation.

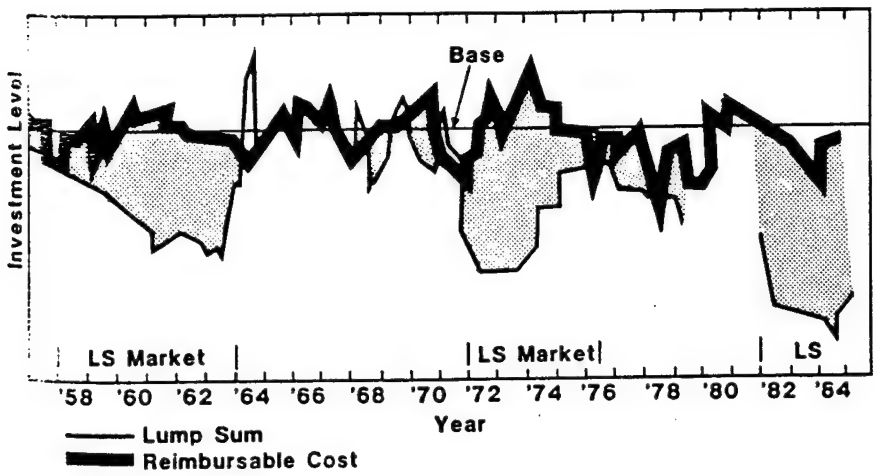


Figure 1: Lump Sum vs. Cost Reimbursable Contracts Relative Investment Levels

Chapter 3: Research Methodology

This chapter will discuss the methodology used to conduct the research contained in this thesis. The source of data for this thesis, the CII Benchmarking and Metrics Databases for 1996 and 1997 is briefly discussed, followed by a description of the techniques used to analyze the data. Since the databases contain some unusable data, as well as potentially erroneous data, the techniques used to account for this data will also be discussed.

3.1 The CII Benchmarking and Metrics Database

CII is an organization of owners and contractors based administratively at the University of Texas at Austin. CII is primarily a research organization whose mission is:

> "...to improve the safety, quality, schedule, and cost effectiveness of the capital investment process through research and implementation support for the purpose of providing a competitive advantage to North American business in the global marketplace." (Hudson 1997).

From its inception in 1983, CII members indicated a strong interest in measurements that could serve as benchmarks. Early efforts included working to standardize nomenclature and definitions that would allow for standardized statistics across the construction industry. The CII Board of Advisors established a Benchmarking and Metrics Committee in 1993, whose objectives were to establish a series of metrics that could be applied to all sectors of the construction

industry and identify "best practices" that could be used to positively influence the metrics being measured.

The efforts of the CII Benchmarking and Metrics Committee came to fruition when the first of what are planned to be annual surveys was sent out in March of 1996. Two versions of the survey were sent out to CII member companies, one for project owners and one for construction contractors. The two surveys were essentially the same, with some minor differences to account for information available to the respective groups. Forty-seven member companies, including 22 owners and 25 contractors, agreed to participate in the initial survey. Each respondent was asked to provide data for at least five projects, and these were to conform to the following criteria:

a. The project was completed during 1994, 1995, or early 1996.

b. The project is located in either the United States or Canada.

c. The project has at least 50,000 craft work-hours.

d. The overall project has a "normal" mix of disciplines for the type of project, i.e., for industrial and building projects: civil, mechanical, and electrical.

e. The overall project includes both design and construction.

f. The project has a total installed cost greater than $5,000,000.

g. The project is not a maintenance or turnaround type project.

Contractors were further urged to report on projects for which they had functioned as the designer or constructor or both and to avoid projects for which they served only as a construction manager or project manager.

Respondents were asked not to select projects randomly. Instead, each was asked to include two "good" projects, two "average" projects and one "bad" project. While the sample produced cannot be construed as representative of each company's projects, it should provide some guidance as to the limits of common experience for the collective respondents.

The second Benchmarking and Metrics Survey, referred to as Version 2.0, was sent out in early 1997. Version 2.0 contained many of the same questions as Version 1.0 as well as additional questions to obtain further detail on certain subjects or to obtain information on additional best practices being studied. These two surveys have resulted in a database containing some 395 projects valued at nearly 21 billion dollars. This data does not represent a random sample of the construction industry, but is instead representative of member companies of the Construction Industry Institute.

David Neil Hudson describes the development of the CII Benchmarking and Metrics Survey in detail in his Doctoral dissertation (Hudson 1997).

3.2 ANALYSIS TECHNIQUES

In order to achieve the objectives set forth by this thesis, the CII Benchmarking and Metrics Database had to be pared down to a manageable size. Accordingly, only the datafields considered pertinent to this thesis were used. First, only projects with construction were considered. Then, all data fields dealing with construction cost, construction schedule, construction changes, and construction safety were utilized, as were those data fields that provided demographic information on the projects being considered.

The following list of questions from the CII Benchmarking and Metrics Survey Version 2.0 were used to generate the pertinent data fields used in this research study:

> *Question 7: Principal type of project (industrial, infrastructure, or building).*
>
> *Question 8: This project was (grass roots, modernization, or add-on).*
>
> *Question 10: Please list the companies, including your company, that helped execute this project (do not list subcontractors). Indicate the function(s) each company performed and the approximate percent of that function to the nearest 10%. For each function, indicate the principle form of remuneration in use at the completion of the work.*
>
> *Question 13: Please indicate the budgeted and actual costs by project phase (pre-project planning, detail design, procurement, construction, and startup)*
>
> *Question 14: Planned and actual project schedule (for each project phase).*
>
> *Question 15: Project development and scope (for each project phase).*
>
> *Question 17b: Project complexity*
>
> *Question 18: Workhours and accident data (total craft workhours, OSHA recordable injuries and OSHA lost workday cases).*

The full version of each question is contained in Appendix A. The complete questionnaires for versions 1.0 and 2.0 are contained in the Benchmarking and Metrics Data Reports (CII 1996 and CII 1997).

There were some minor differences between owner and contractor surveys as well as between Version 1.0 and 2.0 that required reconciliation. For example, the owner data showed all craft-work hours, recordable injury cases and lost workday cases for the project, while the contractor data broke these up between

the contractor's and subcontractors' organizations. Thus, the contractor and subcontractor data had to be added to provide data fields equivalent to that in the owner database. Similarly, Version 1.0 had only one data field for construction changes, while Version 2.0 contained separate data fields for project development changes and scope changes during the construction phase. Again, these data fields were added together so the total construction changes could be compared between Versions 1.0 and 2.0.

Once the desired data fields were assembled, the data itself had to be examined. Many of the projects contained incomplete data. This data was culled prior to analysis. Some of the projects contained data that was obviously erroneous or appeared to be suspect. For example, several projects showed construction completion dates that were prior to construction start dates, an obvious error. Other projects showed actual construction schedule data that was highly inconsistent with the planned construction schedule, such as actual construction duration of four years when the planned construction duration was only two years. CII was notified of erroneous or suspect data when possible, and corrections were made on several projects, primarily in the construction schedule data fields. Re-examining the original questionnaires and entering the correct information into the database was the method used to make corrections. A small number of projects with erroneous or suspect data could not be corrected and were not considered in the analysis.

Project performance factors for cost reimbursable and lump sum projects were compared to determine if relationships exist between them and the use of a particular remuneration type. The project performance factors evaluated were cost growth, schedule growth, design-construction overlap on design-build projects, changes, and safety, including both reportable incident rate and lost workday case incident rate. A similar comparison was also done for performance factors on private and public lump sum projects.

Cost growth for a construction project is defined by CII as follows:

$$Cost\ growth = \frac{actual\ construction\ \text{cost} - budgeted\ construction\ \text{cost}}{budgeted\ construction\ \text{cost}}$$

Schedule growth for a construction project is defined by CII as follows:

$$Schedule\ growth = \frac{actual\ construction\ duration - predicted\ construction\ duration}{predicted\ construction\ duration}$$

Changes consider the entire number of change orders that take place on a construction project.

The Occupational Health and Safety Agency (OSHA) defines recordable incident rate (RIR) for a construction project as follows:

$$RIR = \frac{total\ recordable\ incidents}{total\ craft\ work\ hours} x\ 200{,}000$$

OSHA similarly defines lost workday case incident rate (LWCIR) for a construction project as follows:

$$LWCIR = \frac{total\ lost\ workday\ case\ incidents}{total\ craft\ work\ hours} x\ 200{,}000$$

To analyze the effect of remuneration type on project performance factors, the z-test was used to compare sample means. The z-test analysis of sample means is used to determine whether the difference in sample means are significant, namely, whether they will enable the author to reject the null hypothesis. The null hypothesis is that the sample means are equal using a two-tail level of significance of 0.10 due to the large sample size. The level of significance is required to judge the merits of any conclusions made. It represents the probabilities of Type I or Type II error, namely, the probabilities of erroneously rejecting or erroneously accepting a hypothesis (Blank 1980).

The null hypothesis can be rejected if the z-value is greater than the $z_{0.05}$ value of 1.645 or less than the $-z_{0.05}$ value of –1.645. If the z-value falls between –1.645 and 1.645, then the null hypothesis is not rejected with a 90 percent confidence level.

The sample sizes of public lump sum projects for the performance factors of RIR and LWCIR were less than 30, which is considered a statistically small sample size. In order to take into account the effect of small sample size, the sample means were also compared using the t-test. The t-test works much the

same way as the z-test, only it was designed to take small sample size into account and uses a different test statistic.

Another method used to analyze the effect of remuneration type on project performance factors was the comparison of sample variances. Variance is a measure of the spread or dispersion of a sample (Miller and Freund 1977). The F-test provides a two-tail test for the equality of two variances. As with the z-test, the null hypothesis for the F-test is that the two sample variances are equal. If the F-value is greater than $F_{0.05}$ for (n_2-1, n_1-1) degrees of freedom, then the null hypothesis is rejected and the alternate hypothesis, that $\sigma_1^2<\sigma_2^2$, is accepted. If the F-value is less than $F_{0.05}(n_2\text{-}1, n_1\text{-}1)$, then the null hypothesis is not rejected with a 90 percent confidence level (Miller and Freund 1977).

The results of the analysis for the project performance factors of cost growth, schedule growth, duration ratio, changes, RIR and LWCIR, as well as extensive sample demographics, follows in the next chapter.

Chapter 4: Analysis

This chapter contains the analysis performed on the sample database. Sample demographics are shown to provide information on the type of projects contained in the database. Project performance factors for cost reimbursable and lump sum projects are then compared to determine if relationships exist between them and the use of a particular remuneration type. The project performance factors evaluated are cost growth, schedule growth, design-construction overlap on design-build projects, changes and safety. A similar comparison is also done for performance factors on private and public lump sum projects.

4.1 Sample Demographics

The CII Benchmarking and Metrics Database contains 395 total projects in Versions 1.0 and 2.0. Of those projects, 350 involve construction. These projects are the focus of this study. "LS" and "CR" will denote lump sum and cost reimbursable projects, respectively, in the figures.

4.1.1 Remuneration Type

Figure 2 shows the breakdown by construction contract remuneration type used for all 350 projects. The number of cost reimbursable contracts used is slightly higher than the number of lump sum contracts, 52 percent of the total. This is contradictory to all sources in the literature review, which state that lump sum remuneration is the most widely used in the construction industry. This may be an indication that the sample is not representative of the general population.

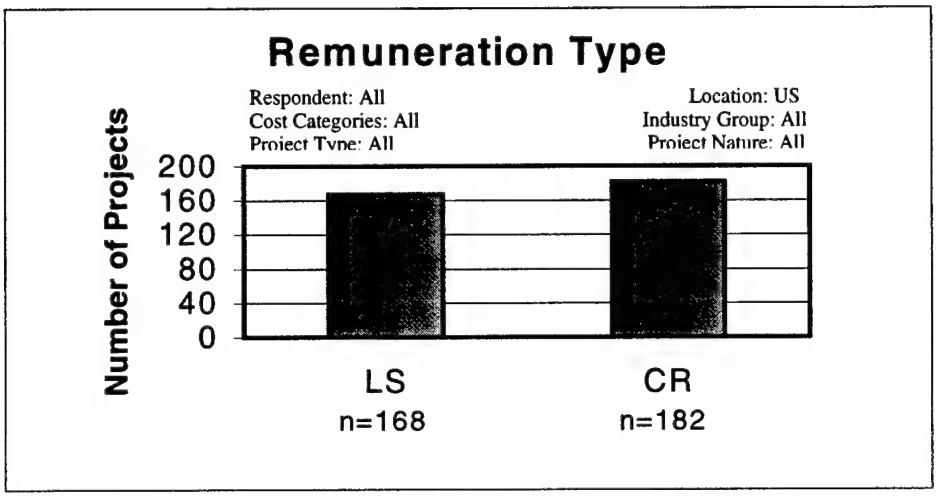


Figure 2: Remuneration Type for All Projects

4.1.2 Owner and Contractor Responses

Figure 3 shows the breakdown of responses by remuneration type used as provided by owner and contractor respondents. This graph shows a well-balanced sample between owner and contractor responses. Both the owner and contractor responses mirror the total sample in that cost reimbursable contracts made up 52 percent of their respective responses. Since owners are normally responsible for choosing the type of remuneration used on a contract, the owner and contractor responses show strong consistency in contract remuneration usage throughout the sample.

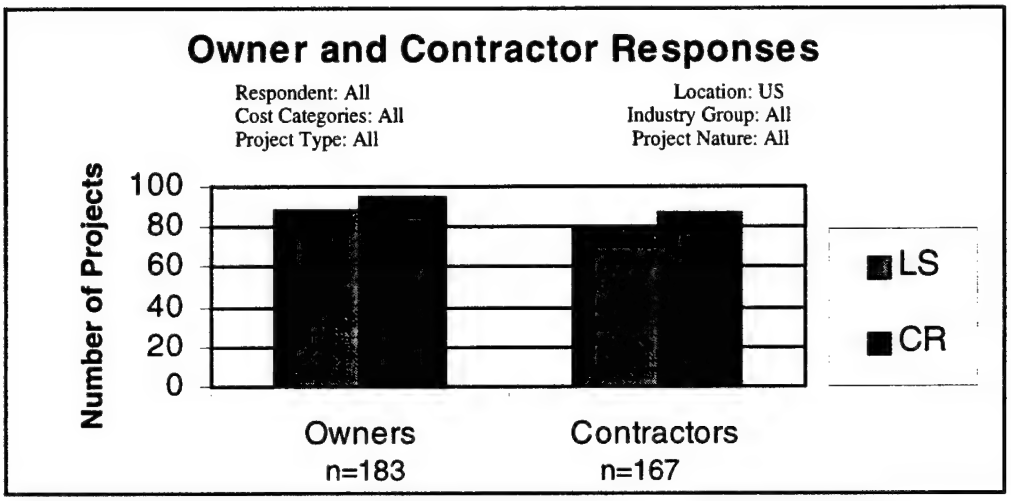


Figure 3: Owner and Contractor Responses by Remuneration

4.1.3 Public and Private Responses

Figure 4 shows the breakdown of responses by remuneration type used on public and private contracts. Private projects make up a vast majority of the 350 projects in this study, 290 or 83 percent. As previously discussed in Chapter 2, public entities are limited to almost exclusive use of lump sum contracts for their construction projects. Of the 60 public responses in this study, 50 of those, or 83 percent, are lump sum contracts. The private sector showed a definite preference for cost reimbursable contracts, using them on 172 out of 290, or 59 percent, of their responses.

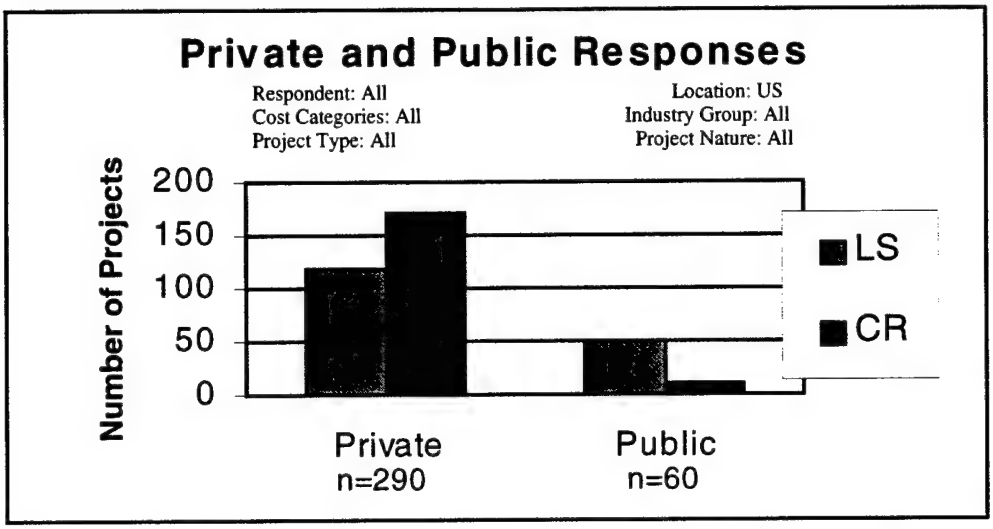


Figure 4: Public and Private Responses by Remuneration Type

4.1.4 Project Type

Figure 5 shows the breakdown of contract remuneration usage by project type. CII, in conducting its Benchmarking and Metrics Surveys, categorized all projects into one of three types: Industrial, infrastructure and building projects. Industrial type projects constitute a large majority of the 350 sample projects, nearly 73 percent. Of these projects, 152, or 60 percent, used cost reimbursable contracts on the construction portion of the project. Industrial projects are more likely to be executed by private owners than public, and the 60 percent cost reimbursable usage closely corresponds to the 59 percent usage of cost reimbursable contracts by private owners. Industrial projects also tend to be more complex and use new or emerging technology, which can make it more difficult to precisely define the project and lead to many project changes. These

conditions lend themselves to usage of cost reimbursable contracts and may account for their higher usage than lump sum contracts in this sample.

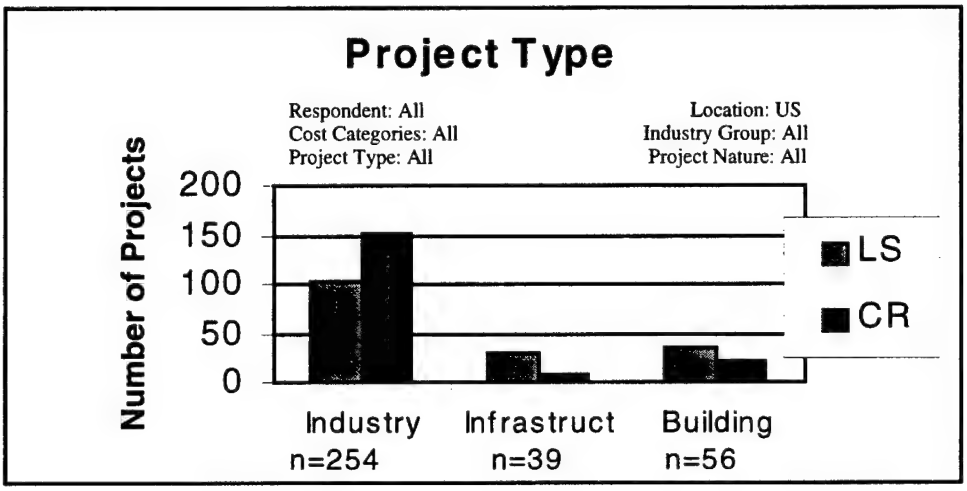


Figure 5: Remuneration Usage by Project Type

Infrastructure and building type projects showed a preference for lump sum contract remuneration. Infrastructure projects are most likely to be executed by public owners, and the 80 percent lump sum usage on these projects also closely corresponds to the 83 percent lump sum usage by public owners. Building type projects used lump sum remuneration 63 percent of the time.

One project was listed as a housing project, which does not fall into any of the three categories shown in Figure 5.

4.1.5 Project Character

Figure 6 shows the breakdown of contract remuneration usage by project character, either add-on, grass roots or modernization. The sample shows good distribution between all three categories. The add-on and grass roots categories showed a slight preference for cost reimbursable contracts, using them 54 and 51 percent of the time, respectively. Lump sum contracts were slightly more numerous in modernization projects, being used 51 percent of the time. Two respondents did not list their project character in their response.

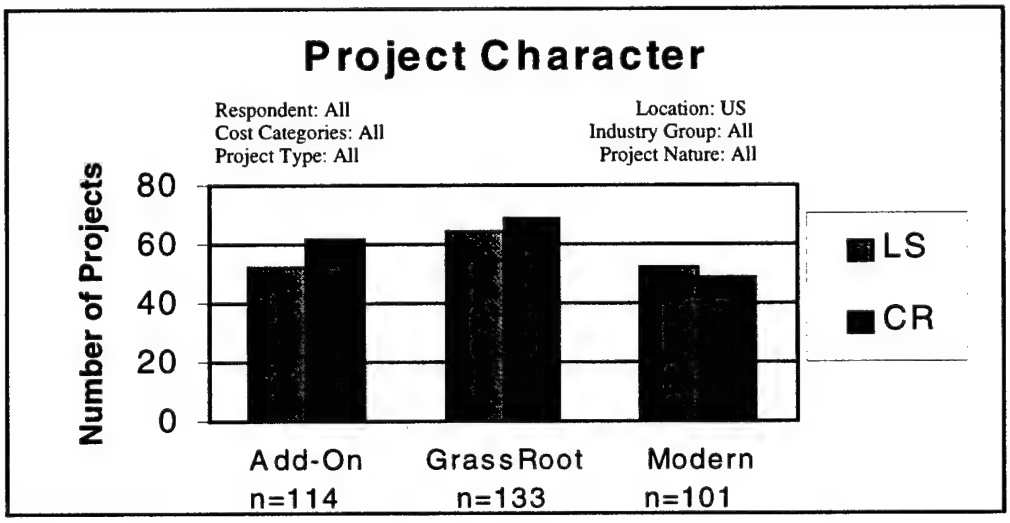


Figure 6: Remuneration Usage by Project Character

4.1.6 Construction Budget Distribution

Figure 7 shows the breakdown of contract remuneration usage by construction budget. The four cost categories shown, less than $15 million,

between $15 and 50 million, between $50 and 100 million, and over $100 million, are the same used in CII's Benchmarking and Metrics data reports, and were used to maintain consistency. No clear trends emerge from this graph. Lump sum contracts were used slightly more on projects less than $15 million, 53 percent of the category. Cost reimbursable contracts were slightly more popular on project between $15 and 50 million, being used 54 percent of the time. The last two cost categories showed a similar slight margin for cost reimbursable contract usage at 53 percent, although this was represented by a mere two projects in the $50 to 100 million category and a single project in the over $100 million category. Twenty-four project questionnaires did not list construction budget.

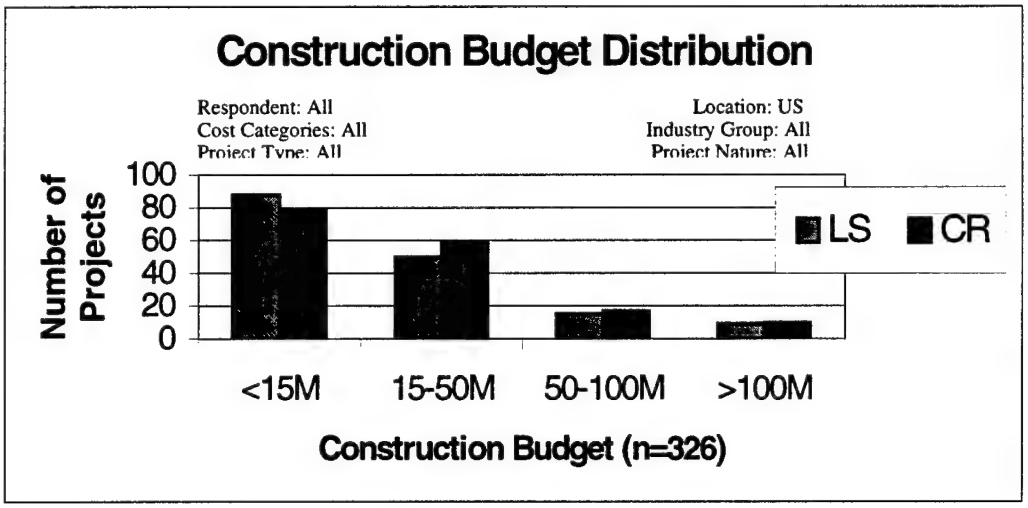


Figure 7: Remuneration Usage by Construction Budget

4.1.7 Construct and Design-Construct Projects

Figure 8 shows the breakdown of contract remuneration usage on construct only contracts and design-construct contracts. On projects where contractors performed only construction services, lump sum contracts were used 54 percent of the time. Projects utilizing design-construct contractors showed a definite preference for cost reimbursable contracts, using them on 83 out of 132 projects, or 63 percent of the time.

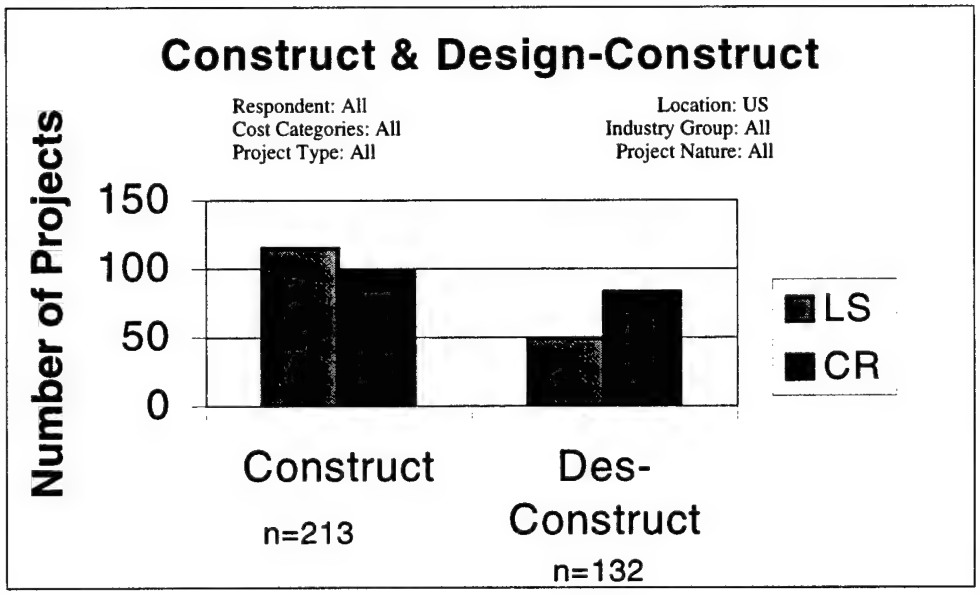


Figure 8: Remuneration Usage by Delivery Method

A key benefit of the design-construct concept is that construction can start before the design is complete, thus shortening overall project duration. Since the project scope is not completely defined under this scenario, a cost reimbursable

contract is an advantageous way to get the project started while reducing contractor risk. This could account for the greater usage of cost-reimbursable contracts in conjunction with a design-construct concept. Five respondents did not identify if a construct only or design-construct concept was used for their projects.

4.1.8 Project Complexity

Figure 9 shows the breakdown of contract remuneration usage by project complexity. Respondents in Version 2.0 were asked to rate their projects by their complexity using the following definitions (Note: this question was not asked in Version 1.0):

> *Low complexity* – Characterized by the use of no unproven technology, small number of process steps, small facility size or process capacity, previously used facility configuration or geometry, proven construction methods.
>
> *High complexity* – Characterized by the use of unproven technology, an unusually large number of process steps, large facility size or process capacity, new facility configuration or geometry, new construction methods, etc.

Of the 158 construction projects extracted from Version 2.0, 156 of them were rated on a scale of one to 10 for complexity. Two projects were not rated for complexity.

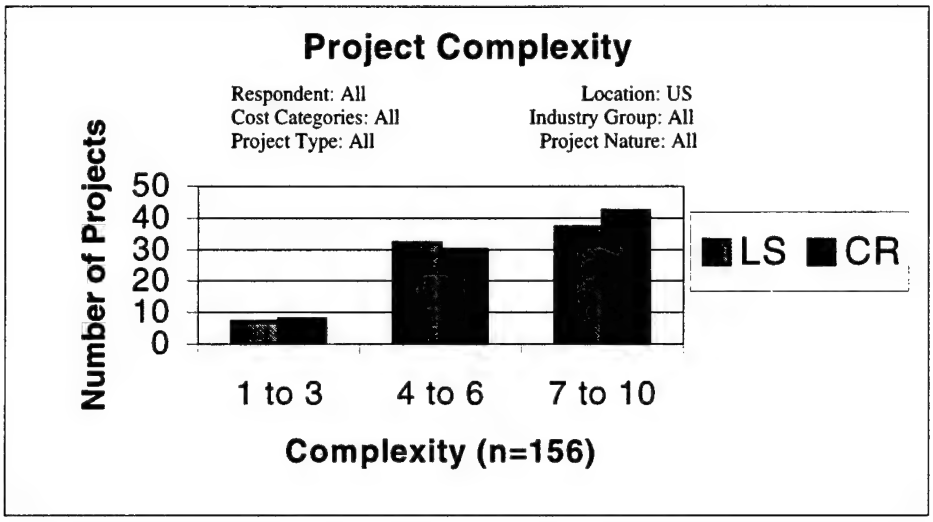


Figure 9: Project Complexity

Only 15 of the projects were rated as "low" complexity (1-3). These were split almost evenly between lump sum and cost reimbursable contracts, seven to eight, respectively. The 62 "average" complexity (4-6) contracts were also split almost evenly, with 32 lump sum and 30 cost reimbursable contracts. The 79 "high" complexity projects were split 37 to 42, or 47 percent to 53 percent for lump sum and cost reimbursable contracts, respectively.

These results do not fully correspond to expectations based upon the literature reviewed. As project complexity increases, a corresponding increase should take place in the use of new or unproven technology, facility size, process steps, etc. All of these tend to increase project risk, and one might expect an increased usage of cost reimbursable contracts to relieve the contractor of some of that risk. Yet, the sample shows that cost reimbursable contracts were only

slightly favored over lump sum contracts for construction projects rated as being high risk.

4.2 Project Performance Factor Evaluation: Lump Sum vs. Cost Reimbursable Projects

This section compares the project performance factors of cost reimbursable and lump sum construction projects to determine if one type of contract remuneration offers better performance over the other. The project performance factors evaluated are cost growth, schedule growth, design-construction overlap on design-build projects, change orders and safety, including both recordable incident rate and lost workday case incident rate.

4.2.1 Construction Cost Growth

Figures 10 and 11 show the cost growth for the lump sum and cost reimbursable construction projects in the sample. There were 159 lump sum projects with construction cost data and 162 cost reimbursable projects with construction cost data. Sixty-five percent of the lump sum projects fell between -10 percent and 20 percent cost growth, while 65 percent of the cost reimbursable projects fell between -20 percent and 20 percent cost growth. Lump sum projects ranged between -42 percent and 121 percent cost growth, while cost reimbursable projects ranged between -37 percent and 111 percent. The average cost growth for the lump sum projects was 8.8 percent, versus an average cost growth of 9.2 percent for cost reimbursable projects.

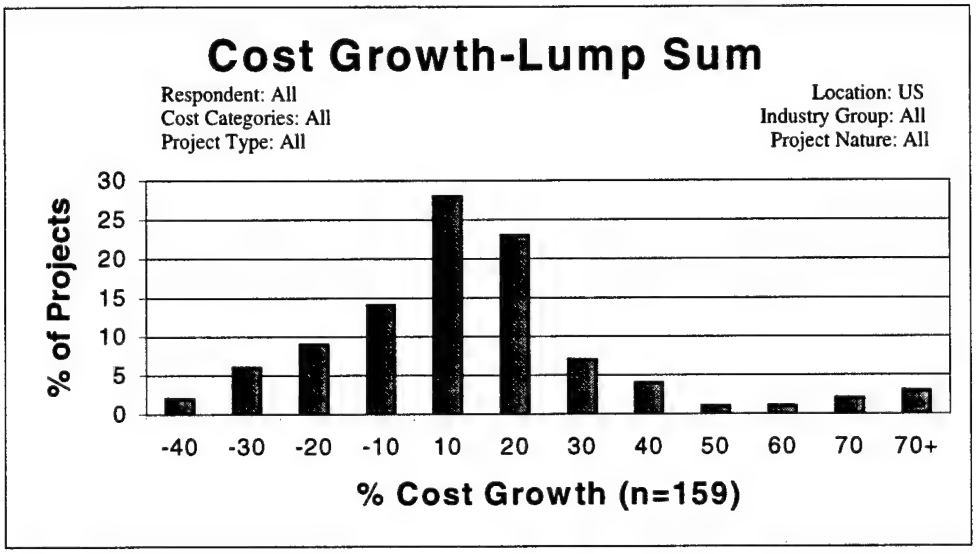


Figure 10: Cost Growth for Lump Sum Construction Projects

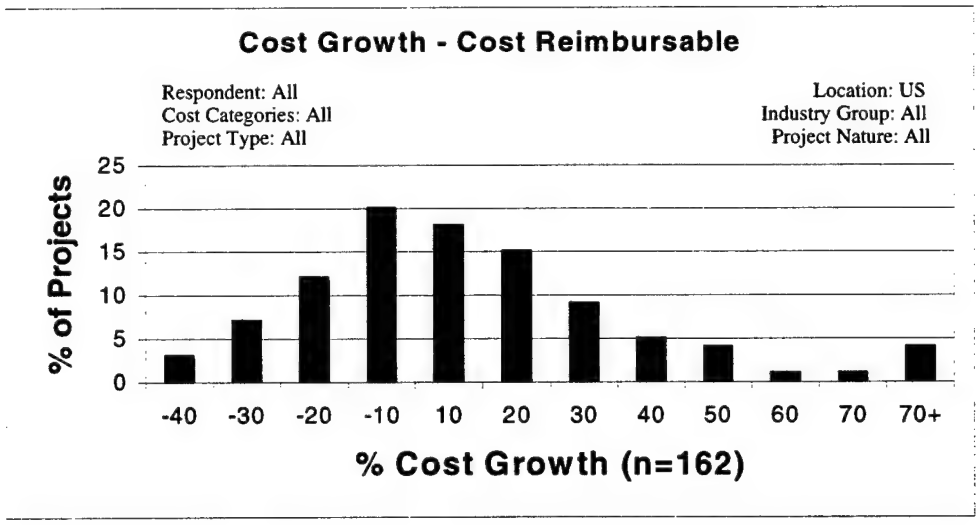


Figure 11: Cost Growth for Cost Reimbursable Construction Projects

The results of the z-test applied to the comparison of sample means for cost growth is 0.138, which is less than $z_{0.05}$=1.645. Thus the null hypothesis is not rejected. The analysis shows that there is no difference between the means for cost growth for the lump sum and cost reimbursable projects in the sample.

The variances for the two samples were 853 and 539 for lump sum and cost reimbursable projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 1.58, which is more than $F_{0.05}(161,158)$=1.00. Thus the null hypothesis is rejected and the alternate hypothesis, that the variance for lump sum contracts is less than the variance for cost reimbursable contracts, is accepted. In other words, the lump sum projects were more predictable.

4.2.2 Construction Schedule Growth

Figures 12 and 13 show the construction schedule growth distributions for lump sum and cost reimbursable projects. The lump sum projects show a fairly even distribution between -10 percent and 40 percent schedule growth, with 66 percent of the projects falling in this range. The cost reimbursable projects are more tightly grouped, with 60 percent of the projects falling between -10 percent and 30 percent. As with cost growth, both lump sum and cost reimbursable projects showed a wide range in schedule growth values. The 136 lump sum projects with construction schedule data showed schedule growth from -47 percent to 143 percent, while the 151 cost reimbursable projects ranged from -49 percent to 146 percent schedule growth.

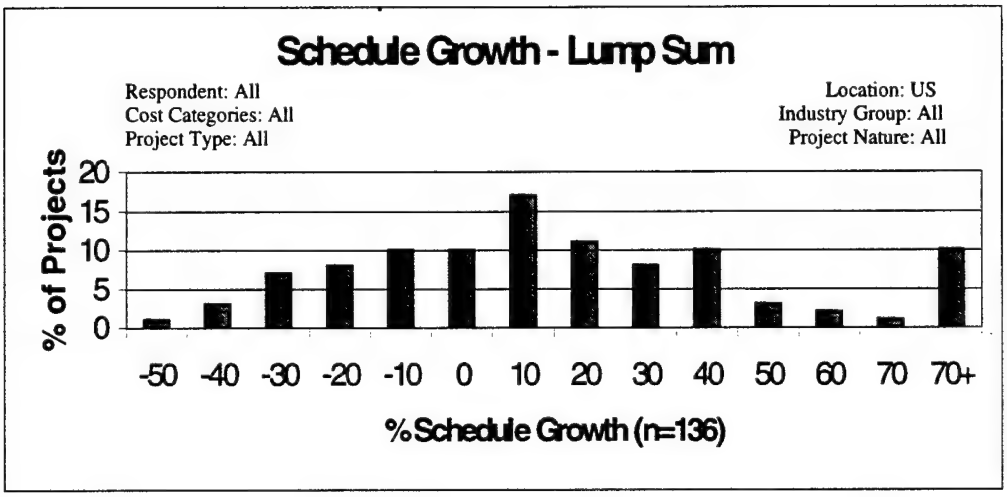


Figure 12: Schedule Growth for Lump Sum Construction Projects

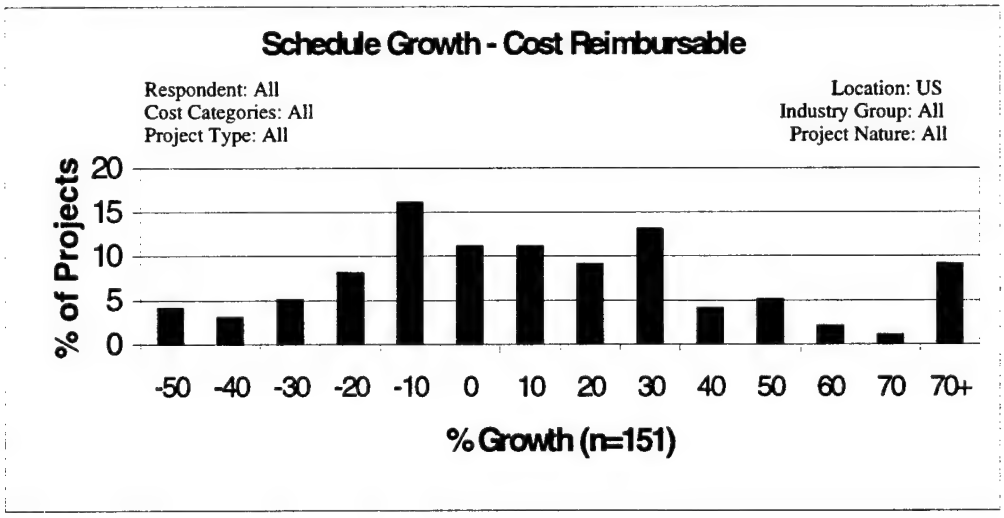


Figure 13: Schedule Growth for Cost Reimbursable Construction Projects

The averages for lump sum and cost reimbursable projects were 16.1 percent and 13.1 percent, respectively. Using the z-test analysis to compare the means produces a z-value of –0.24, which is greater than $-z_{0.05}$ of -1.645. Thus the null hypothesis, that the sample means are equal, is not rejected with a 90 percent confidence level. The analysis shows that there is no statistical difference between the mean schedule growth for lump sum and cost reimbursable projects.

The variances for the two samples were 1,282 and 1,303 for cost reimbursable and lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 1.02, which is more than $F_{0.05}(135,150)=1.00$. Thus the null hypothesis is rejected and the alternate hypothesis, that the variance for cost reimbursable contracts is less than the variance for lump sum contracts, is accepted.

4.2.3 Design-Construction Overlap for Design-Build Projects

An important consideration for using the design-build concept to execute a construction project is the potential timesaving that can be realized by starting construction before the design is complete. In the traditional design-bid-build process, project duration is usually equal to the design duration plus the construction duration, as well as any bid process duration that may be involved. Since a single entity executes the design-build process, the bid process is removed and design and construction are overlapped.

In order to compare the performance of lump sum and cost reimbursable design-build projects, the "duration ratio" of each will be examined. Duration ratio is defined as follows:

$$Duration\ ratio = \frac{design\ duration + construction\ duration}{duration\ from\ design\ start\ to\ construction\ completion}$$

Figures 14 and 15 show the distribution for lump sum and cost reimbursable design-build projects. The 37 lump sum projects show a skewed distribution, while the 58 cost reimbursable projects show a bi-modal distribution. The cost reimbursable project distribution shows some projects with a duration ratio less than one, which indicates construction did not commence until the design was completely finished, which seems to negate one of the primary benefits of a design-build contract.

The mean duration ratio for lump sum projects is 1.31 and the mean for cost reimbursable projects is 1.36. Using the z-test to compare the means results in a z-value of –1.06, which is greater than a $z_{0.05}$ of -1.645. Thus, the null hypothesis, that the sample means are equal, is not rejected with a 90 percent confidence level. This shows that there is no statistical difference between the mean duration ratio for lump sum and cost reimbursable design-build projects.

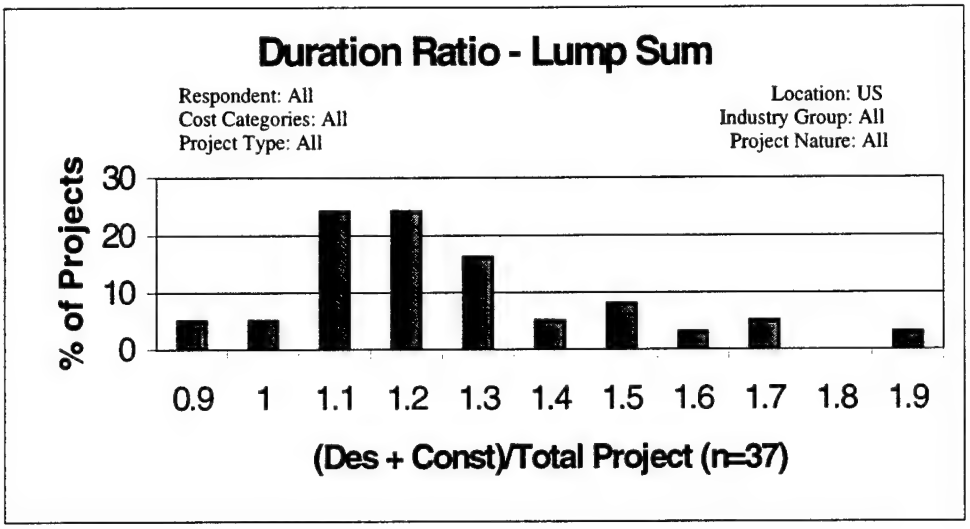


Figure 14: Duration Ratio for Lump Sum Construction Projects

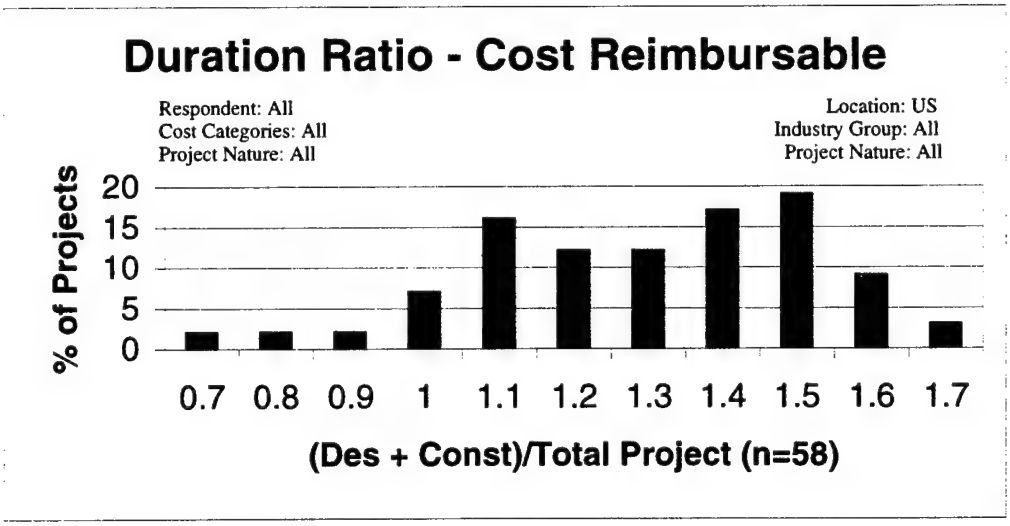


Figure 15: Duration Ratio for Cost Reimbursable Construction Projects

The variances for the two samples were 0.53 and 0.48 for cost reimbursable and lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 1.10, which is less than $F_{0.05}(57,36)=1.64$. Thus, the null hypothesis is not rejected and the analysis shows there is no difference in variance in duration ratio for lump sum and cost reimbursable projects.

4.2.4 Construction Changes

Figures 16 and 17 show the change order distribution for lump sum and cost reimbursable projects. Both types of contract remuneration showed a broad and relatively uniform distribution for change orders. Sixty-one percent of the 127 lump sum projects with change order data experienced 50 or fewer changes, while 53 percent of the 138 cost reimbursable projects with change order data experienced 50 or fewer changes. Both lump sum and cost reimbursable distributions show a large range, with each showing a significant number of projects with over 100 changes. Lump sum projects ranged from zero to 1,699 changes. Cost reimbursable projects ranged from zero to 1,778 changes, with five projects having more than 1,000 changes.

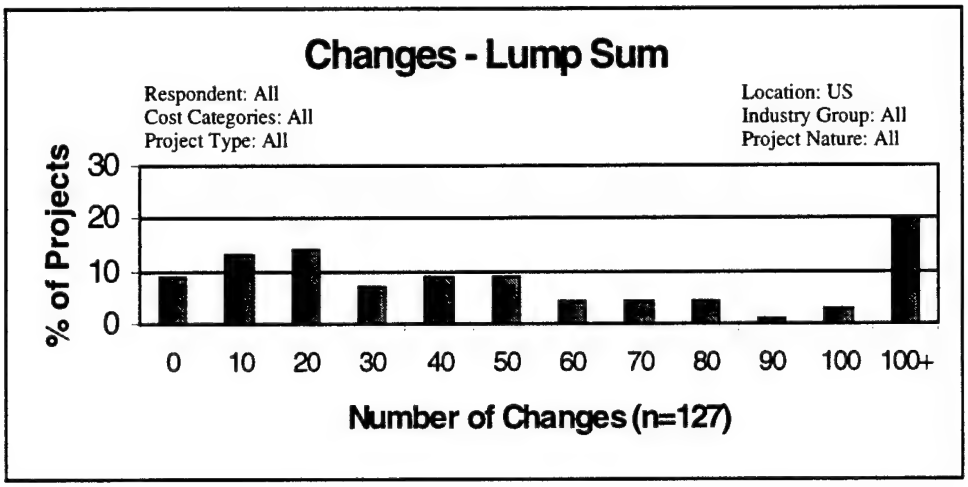


Figure 16: Changes for Lump Sum Construction Projects

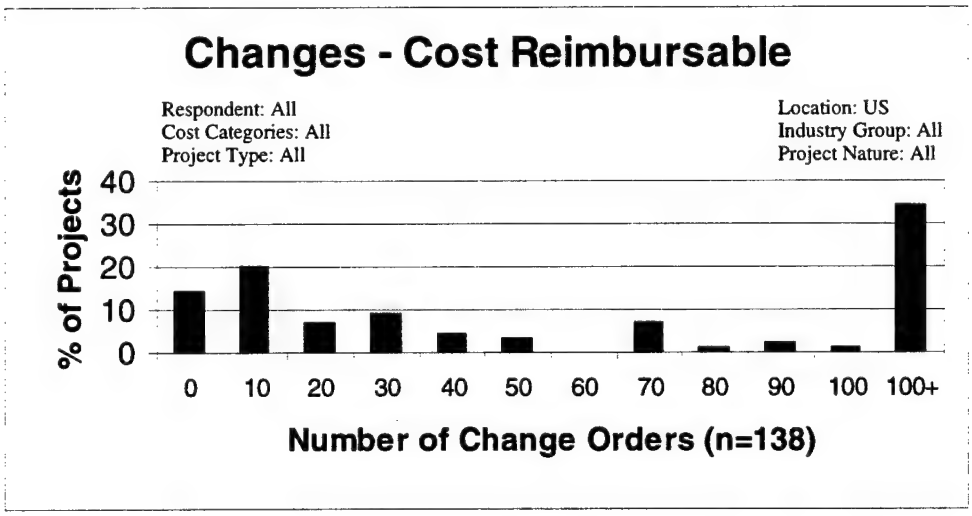


Figure 17: Changes for Cost Reimbursable Construction Projects

The mean number of changes for lump sum projects was 91.4, while the mean for cost reimbursable projects was 139.2 changes. Using the z-test to compare the means results in a z-value of 1.55, which is less than $z_{0.05}$ of 1.645. Thus, the null hypothesis, that the sample means are equal, is not rejected. This shows that there is no statistical difference in the number of changes between lump sum and cost reimbursable projects. However, there is a difference when an 80 percent confidence level is used. This may be indicative of poor scope definition and the technical complexity of many cost reimbursable contracts.

The variances for the two samples were 84,332 and 38,848 for cost reimbursable and lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 2.17, which is greater than $F_{0.05}(137,126)=1.00$. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. The analysis shows that the variance in changes for lump sum projects is lower than the variance for cost reimbursable projects in the sample.

4.2.5 Safety

Figure 18 shows the Recordable Incident Rate (RIR) for both lump sum and cost reimbursable projects. The distributions for both types of contract remuneration are more heavily weighted towards the lower end of the scale. Fifty-seven percent of the 113 lump sum projects with RIR data reported a RIR of 3.0 or less while 60% of the 153 cost reimbursable projects with RIR data reported a RIR of 3.0 or less. Both lump sum and cost reimbursable projects reported a substantial number of projects with a RIR of zero, 31 percent and 20

percent, respectively. The lump sum projects ranged from 0.0 to 21.7, while the cost reimbursable projects ranged from 0.0 to 21.9.

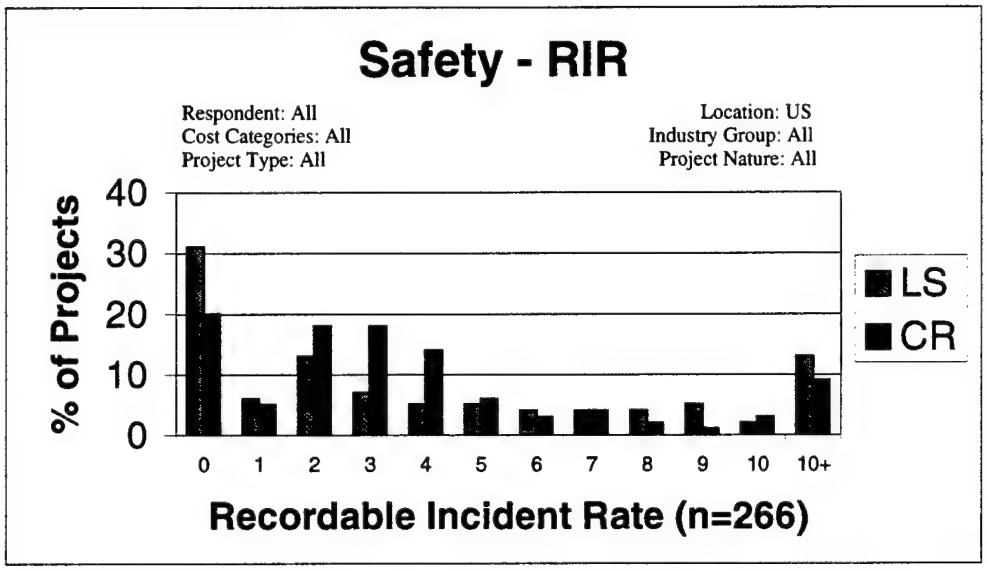


Figure 18: Recordable Incident Rate Data

The mean RIR for lump sum projects was 4.1 and the mean for cost reimbursable projects was 3.6. Using the z-test to compare the means results in a z-value of 0.90, which is less than $z_{0.05}$ of 1.645. Thus, the null hypothesis, that the means are equal, is not rejected. The analysis shows that there is no statistical difference between the mean RIR for lump sum and cost reimbursable projects.

The variances for the two samples were 25.4 and 16.7 for lump sum and cost reimbursable projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 1.52, which is greater than $F_{0.05}(112, 152)=1.22$. Thus, the null hypothesis is rejected and the alternate hypothesis is

accepted. The analysis shows that the variance in RIR for cost reimbursable projects is lower than the variance for lump sum projects in the sample.

Figure 19 shows the Lost Workday Case Incident Rate (LWCIR) distribution for lump sum and cost reimbursable projects. Both types of contract remuneration show heavy skewing towards a LWCIR of zero, with 60 percent of the lump sum projects and 64 percent of the cost reimbursable projects reporting an actual LWCIR of zero. The 115 lump sum projects with Lost Workday Case information ranged in LWCIR from zero to 23. The 152 cost reimbursable projects ranged in LWCIR from zero to 12.9.

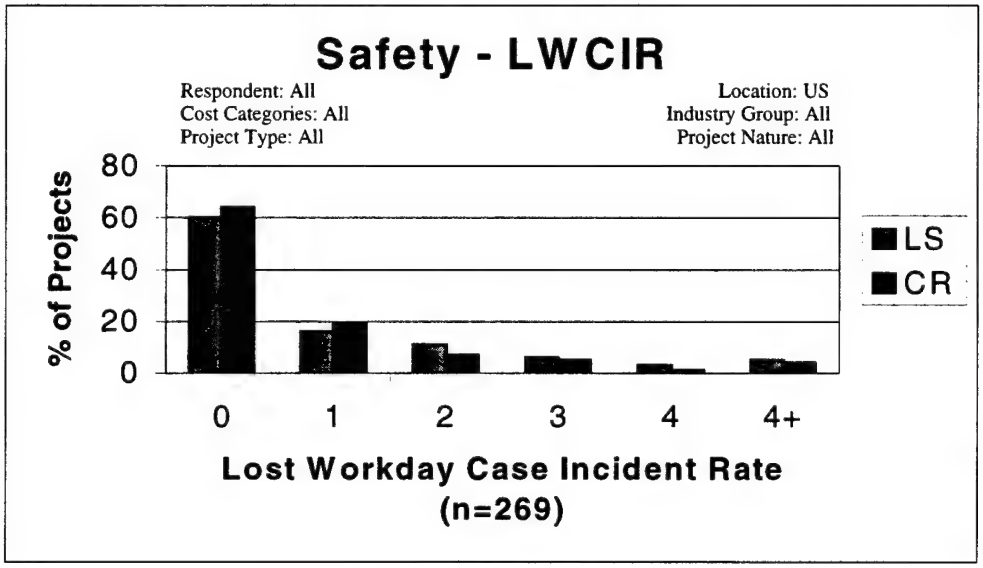


Figure 19: Lost Workday Case Incident Rate Data

The lump sum projects had a mean LWCIR of 0.88 and the cost reimbursable had a mean LWCIR of 0.57. Using the z-test to compare the sample

means produces a z-value of 1.15, which is less than $z_{0.05}$ of 1.645. Thus, the null hypothesis, that the sample means are equal, is not rejected.

The variances for the two samples were 6.47 and 2.20 for lump sum and cost reimbursable projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 2.94, which is greater than $F_{0.05}(114, 151)=1.22$. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. The analysis shows that the variance in LWCIR for cost reimbursable projects is lower than the variance for lump sum projects in the sample. It is noted, however, that a single lump sum project reported an LWCIR of 23, which was far greater than the next lowest data point, which was less than 10. Were this single outlying data pointed excluded, the null hypothesis would not be rejected.

4.2.6 Summary: Lump Sum vs. Cost Reimbursable Projects

Table 2 provides a summary of the comparison of means conducted in this section. The z-tests for all performance factors provided absolute z-values less than $z_{0.05} = 1.645$, thus the null hypothesis, that the sample means are equal, was not rejected for all performance factors. This shows that there is no difference between any of the performance factor means for lump sum and cost reimbursable projects for this sample

Table 2: Summary of Performance Factor Comparison of Means

Performance Factor	Lump Sum Mean	Cost Reimbursable Mean	z-Test Value	Reject H_0?
Cost Growth	8.8%	9.2%	0.14	No
Schedule Growth	16.1%	13.1%	0.24	No
Duration Ratio	1.31	1.36	1.06	No
Changes*	91.4	139.2	1.55	No
RIR	4.1	3.6	0.90	No
LWCIR	0.57	0.88	1.15	No

*Significantly different at 80% confidence level.

Table 3 provides a summary of the comparison of variances conducted in this section. The F-test showed that lump sum projects in the sample had lower variance for the performance factors of cost growth and changes while cost reimbursable projects in the sample had a lower variance for the performance factors of schedule growth and safety, both RIR and LWCIR. There was no difference in variance between lump sum and cost reimbursable projects in the sample for duration ratio.

Table 3: Summary of Performance Factor Comparison of Variance

Performance Factor	Lump Sum Variance	Cost Reimbursable Variance	F-Test Value	$F_{0.05}$ Test Statistic	Reject H_0?
Cost Growth*	539	853	1.58	1.00	Yes
Schedule Growth	1,303	1,282	1.02	1.00	Yes
Duration Ratio*	0.048	0.053	1.10	1.64	No
Changes*	38,848	84,332	2.17	1.00	Yes
RIR*	25.4	16.7	1.52	1.22	Yes
LWCIR*	6.47	2.20	2.94	1.22	Yes

*Significantly different at a 0.05 level.

4.3 Project Performance Factor Evaluation: Private vs. Public Lump Sum Projects

As was done in the comparison of lump sum and cost reimbursable projects, the project performance factors of cost growth, schedule growth, changes and safety will be evaluated for private and public lump sum projects. The object is to determine if one sector achieved better performance over the other in any of the factors being evaluated.

4.3.1 Construction Cost Growth

Figures 20 and 21 show the cost growth distributions for private and public lump sum projects. Both appear to be normal type distributions, although there are some gaps in the curve. Sixty-nine percent of the private lump sum projects fall between –20 percent and 20 percent cost growth, while 78 percent of

the public lump sum projects fall between –10 percent and 20 percent cost growth. The 113 private lump sum projects with construction cost growth data ranged from –42 percent to 121 percent cost growth. The 46 public lump sum projects with construction cost growth data were spread over a range from –28 percent to 58 percent cost growth.

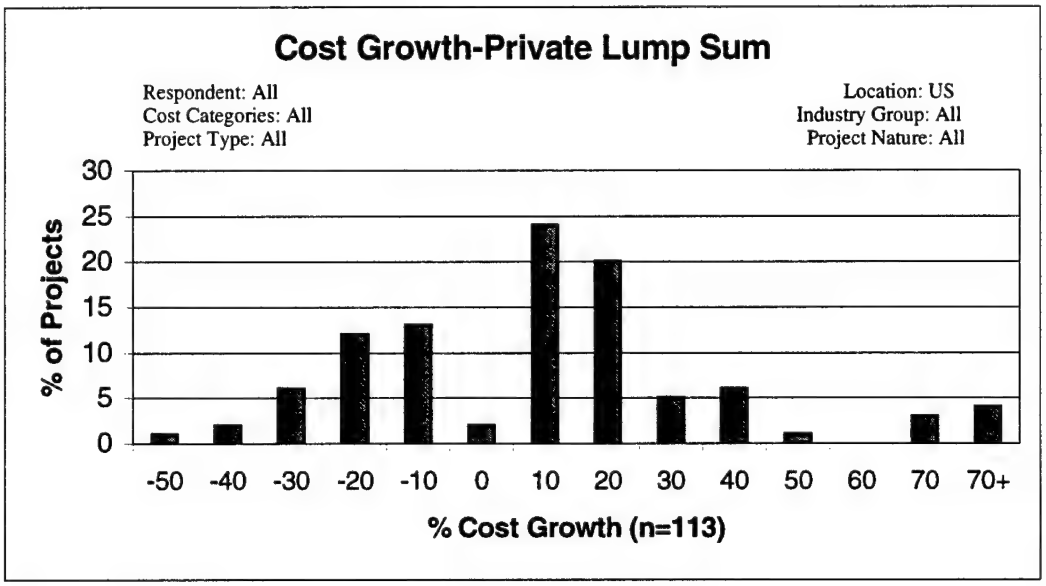


Figure 20: Cost Growth for Private Lump Sum Construction Projects

The private lump sum projects had a mean construction cost growth of 8.9 percent, while the public lump sum projects had a mean of 8.4 percent. Using the z-test to compare the sample means results in a z-value of 0.15, which is less than $z_{0.05}$=1.645. Thus, the null hypothesis, that the sample means are equal, is not

rejected. This shows there is no statistical difference in mean cost growth between private and public lump sum projects for this sample.

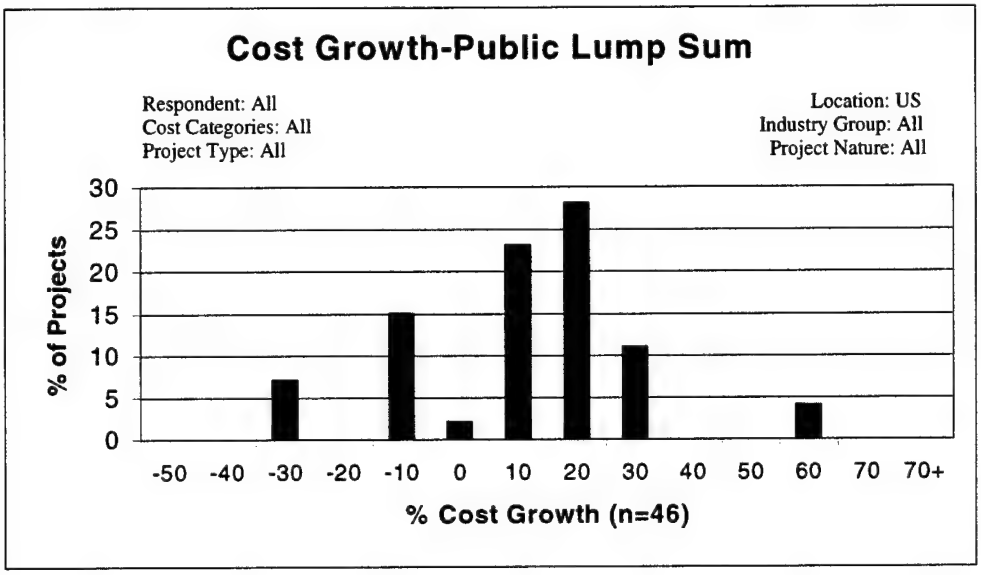


Figure 21: Cost Growth for Public Lump Sum Construction Projects

The variances for the two samples were 660 and 246 for private and public lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 2.68, which is greater than $F_{0.05}(112, 45) = 1.58$. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. The analysis shows that the variance in cost growth for public lump sum projects is lower than the variance for private lump sum projects in the sample.

4.3.2 Construction Schedule Growth

Figures 22 and 23 show the construction schedule growth distributions for private and public lump sum projects. Both appear to be normal type distributions, although both have a group of outlying data points above 70 percent schedule growth, particularly the private lump sum projects. Eleven out of 98 private lump sum projects with construction schedule growth data, or 11 percent, had construction schedule growth over 70 percent. Only 2 out of 38 public lump sum projects, or six percent, reported construction schedule growth over 70 percent. Private lump sum projects reported construction schedule growth ranging from –41 percent to 143 percent. Public lump sum projects ranged from –47 percent to 93 percent.

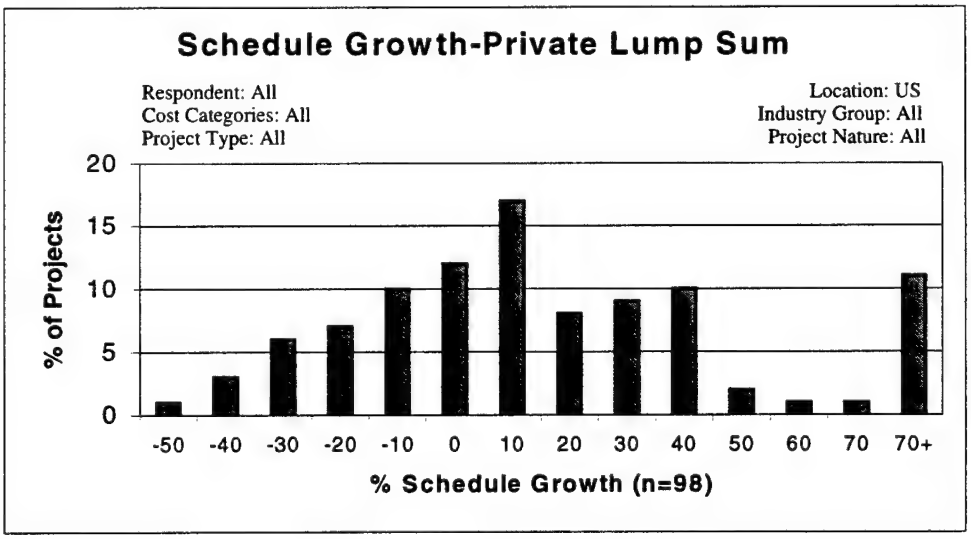


Figure 22: Schedule Growth for Private Lump Sum Construction Projects

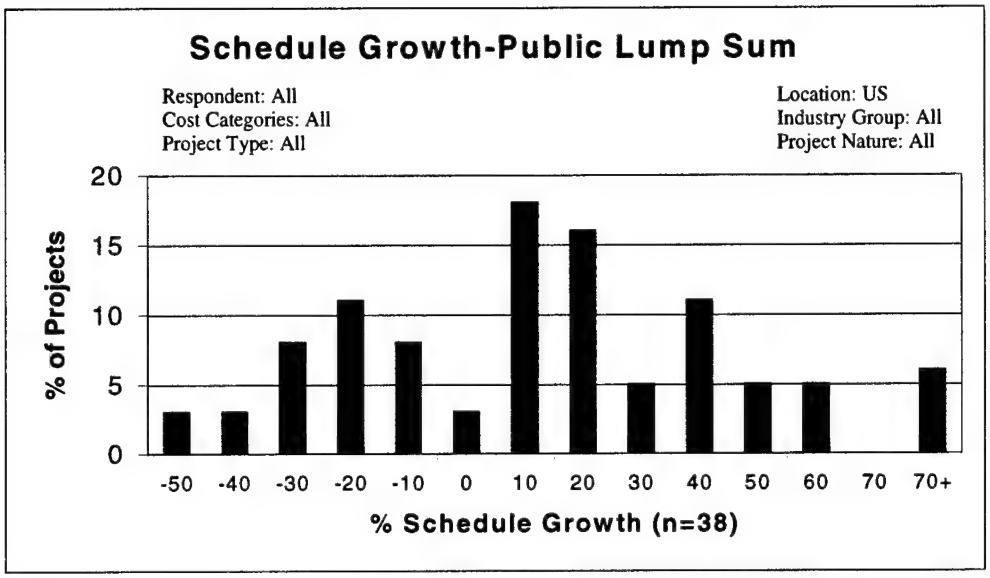


Figure 23: Schedule Growth for Public Lump Sum Construction Projects

The mean construction schedule growth for private lump projects was 17.7 percent, while the mean for public lump sum projects was 12.0 percent. Using the z-test to compare sample means produces a z-value of 0.34, which is less than $z_{0.05}$=1.645. Thus, the null hypothesis, that the sample means are equal, is not rejected. This shows there is no statistical difference in mean schedule growth between private and public lump sum projects in this sample.

The variances for the two samples were 1,459 and 9,940 for private and public lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 6.81, which is greater than $F_{0.05}(37, 97)$ = 1.64. Thus, the null hypothesis is rejected and the alternate hypothesis is

accepted. The analysis shows that the variance in cost growth for private lump sum projects is lower than that for public lump sum projects in the sample.

4.3.3 Construction Changes

Figures 24 and 25 show the distributions for changes to private and public lump sum construction projects. Both demonstrate wide data distributions and large outlying data groups beyond 100 change orders. Eleven out of 40 public lump sum projects with change data, or 28 percent, reported over 100 changes during the construction phase of the project, with a high of 1,699 changes reported. Private lump sum projects fared slightly better, with 17 of 98 projects, or 17 percent, reporting more than 100 changes with a high of 961 changes reported.

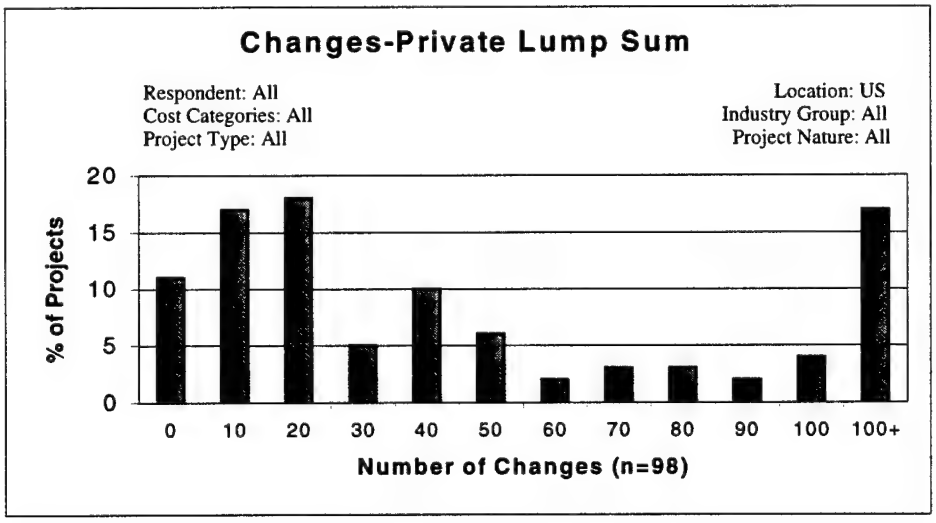


Figure 24: Changes for Private Lump Sum Construction Projects

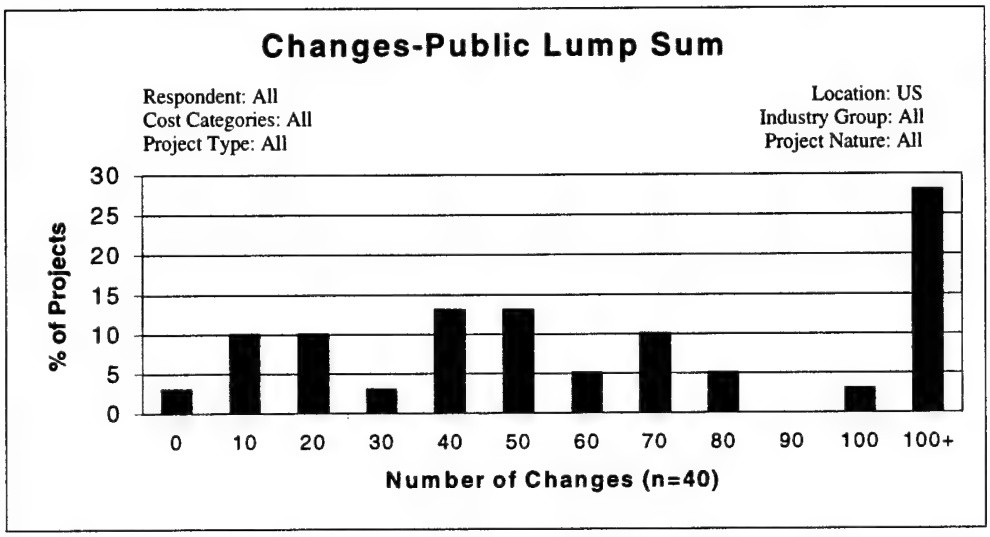


Figure 25: Changes for Public Lump Sum Construction Projects

Those projects with large numbers of construction changes heavily influenced the sample means. Private lump sum projects had a mean of 79.3 changes while the public lump sum projects had a mean of 120.8 changes. Using the z-test to compare the sample means produces a z-value of –0.90, which is greater than $z_{0.05}$=-1.645. Thus, the null hypothesis, that the sample means are equal, is not rejected. This shows that there is no statistical difference in the mean number of changes between private and public lump sum projects in this sample.

The variances for the two samples were 23,932 and 75,900 for private and public lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 3.16, which is greater than $F_{0.05}(39, 97)$ = 1.64. Thus, the null hypothesis is rejected and the alternate hypothesis is

accepted. The analysis shows that the variance in changes for private lump sum projects is lower than the variance for public lump sum projects in the sample.

4.3.4 Safety

Figure 26 shows the Recordable Incident Rate (RIR) distributions for private and public lump sum construction projects. Both show broad data distributions with large data groups at zero RIR.

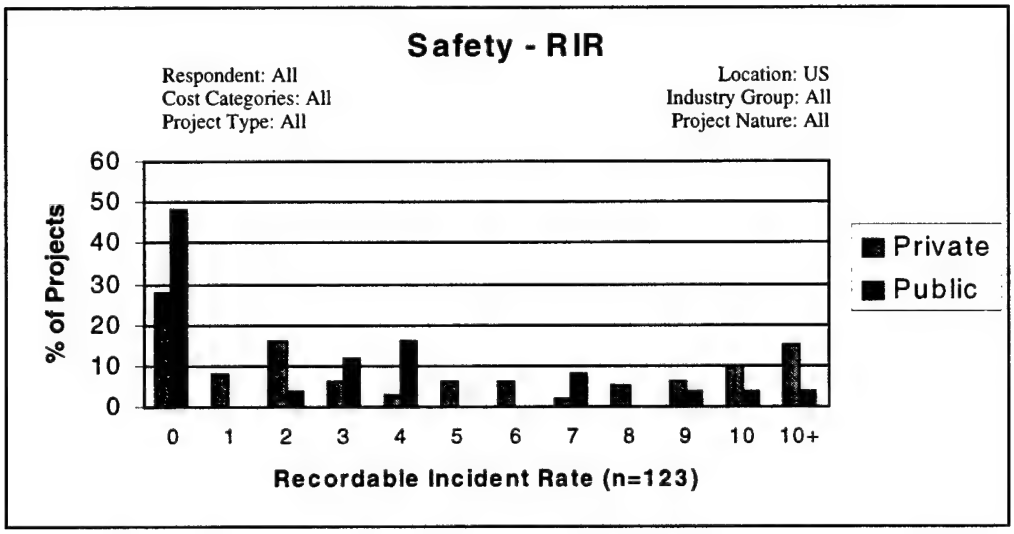


Figure 26: Recordable Incident Rate Data for Lump Sum Projects

Private lump sum projects show 23 out of 98, or 26 percent, with an RIR of zero, and 59 percent report an RIR of 4.0 or less. Twelve out of 25 public lump sum projects, or 48 percent, report an RIR of zero, and 80 percent report an RIR of 4.0 or less. Fifteen of the private lump sum projects, or 15 percent,

reported an RIR over 10.0, including a high of 21.7, as compared to only one of the lump sum projects, or four percent, which reported an RIR of 15.4.

The sample size for public lump sum projects is considered statistically small when compared to the sample size for private lump sum projects, 25 versus 88. To account for this small sample size, the t-test was used to compare the sample means. Using the t-text results in a t-value of 1.62, which is less than $t_{0.05}(113) = 1.645$. Thus, the null hypothesis is not rejected. However, if an 80 percent confidence level is used for the t-test, the null hypothesis is rejected and the alternate hypothesis is accepted. In other words, the mean RIR for public lump sum projects is less than the mean RIR for private lump sum projects.

The variances for the two samples were 27.9 and 14.9 for private and public lump sum projects, respectively. The results of the F-test applied to the sample variances produces an F-value of 1.87, which is greater than $F_{0.05}(87,24) = 1.82$. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. The analysis shows that the variance in RIR for public lump sum projects is lower than the variance for private lump sum projects in the sample.

Figure 27 shows the Lost Workday Case Incident Rate (LWCIR) data distributions for private and public lump sum construction projects. Both show over half their projects reporting an LWCIR of zero: Fifty-six of 91, or 65 percent of the private lump sum projects, and 14 of 25, or 56 percent of the public lump sum projects. The remainder of both distributions showed a general declining trend as the LWCIR value increased.

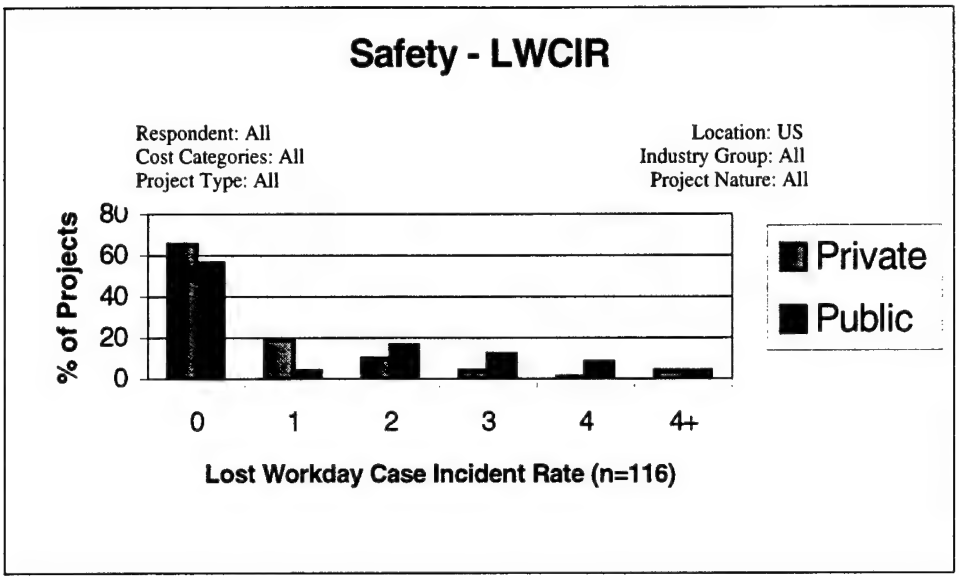


Figure 27: LWCIR Data for Private and Public Lump Sum Projects

The public lump sum projects ranged to a high LWCIR of 6.0, while the private lump sum projects ranged to a high LWCIR of 23.0, which was well beyond the next highest contract, which had an LWCIR of 9.8.

As with RIR, the public lump sum sample for LWCIR was only 25 projects. To account for this statistically small sample size, the t-test was again used to compare sample means. Using the t-test produced a t-value of 0.42, which is less than $t_{0.05}(116) = 1.645$. Thus, the null hypothesis is not rejected, which shows the there is no statistical difference in mean LWCIR between private and public lump sum construction projects in the sample.

The variances for the two samples were 7.55 and 2.38 for private and public lump sum projects, respectively. The results of the F-test applied to the

sample variances produces an F-value of 3.17, which is greater than $F_{0.05}(90,24)$ = 1.82. Thus, the null hypothesis is rejected and the alternate hypothesis is accepted. The analysis shows that the variance in LWCIR for public lump sum projects is lower than the variance for private lump sum projects in the sample.

4.3.5 Summary: Private vs. Public Lump Sum Projects

Table 4 provides a summary of the performance factor comparison conducted in this section. The z-tests and t-tests for all performance factors were within test statistics, thus the null hypothesis, that the sample means are equal, was not rejected for the performance factors of cost growth, schedule growth, changes, RIR, and LWCIR. This shows that there is no statistical difference between any of these performance factor means for private and public lump sum projects in this sample. A large difference in sample sizes, 25 public lump sum projects versus 88 and 91 private lump sum projects, respectively, for RIR and LWCIR, warranted the use of the t-test to compare the means of these two performance factors. The t-test result for RIR indicates that the null hypothesis is not rejected at a 90 percent confidence level, although the null hypothesis is rejected and the alternate hypothesis is accepted at an 80 percent confidence level.

Table 5 provides a summary of the comparison of variances conducted in this section. The F-test showed that private lump sum projects in the sample had lower variance for the performance factors of schedule growth and changes, while public lump sum projects in the sample had a lower variance for the performance factors of cost growth and safety, both RIR and LWCIR.

Table 4: Summary of Performance Factor Comparison of Means

Performance Factor	Private Lump Sum Mean	Public Lump Sum Mean	z-Test Value	t-Test Value	Reject H_0?
Cost Growth	8.9%	8.4%	0.15	N/A	No
Schedule Growth	17.7%	12.0%	0.34	N/A	No
Changes	79.3	120.8	0.90	N/A	No
RIR*	4.53	2.69	N/A	1.62	No
LWCIR	0.82	1.06	N/A	0.42	No

*Significant difference at 80% confidence level.

Table 5: Summary of Performance Factor Comparison of Variance

Performance Factor	Private Lump Sum Variance	Public Lump Sum Variance	F-Test Value	$F_{0.05}$ Test Statistic	Reject H_0?
Cost Growth	660	246	2.68	1.58	Yes
Schedule Growth	1,459	9,940	6.81	1.64	Yes
Changes	23,932	75,735	3.16	1.64	Yes
RIR	27.9	14.9	1.87	1.82	Yes
LWCIR	7.55	2.38	3.17	1.82	Yes

Chapter 5: Conclusions

This chapter presents conclusions based on the research and analysis conducted in the previous chapters.

The literature review revealed that the type of contract remuneration used on a construction project is dependent on a number of factors. In some instances, the type of remuneration used may be based purely on owner preference, but typically the following motivating factors are involved:

- How well the project scope is defined.
- The amount of risk involved in the project.
- Schedule sensitivity of the project.
- The amount of changes anticipated in the contract.
- The level of owner involvement anticipated for the project.

Variations in these factors will influence the type of contract remuneration. Projects with well defined scopes of work, low or readily defined risks, low schedule sensitivity, small number of anticipated changes and a low level of owner involvement are well suited to lump sum contracts. Conversely, projects with less well defined scopes, high or poorly defined risks, high schedule sensitivity, large number of anticipated changes and high level of owner involvement are better suited to cost reimbursable contracts.

The sample demographics produced some interesting results. In contrast with information obtained in the literature review which stated that lump sum contracts are the most common type of remuneration used today, owners who

provided project information for the CII Benchmarking and Metrics Survey showed a slight preference for cost reimbursable contracts. The large majority of industrial type projects in the sample, nearly 73 percent, and the relatively large dollar value of those projects, all of which are at least five million dollars, might account for this difference from the general population. These large, potentially complex projects are better suited for execution using a cost reimbursable contract. Indicative of this is that 60 percent of the industrial type projects used cost reimbursable contracts.

The private owners showed a definite preference for cost reimbursable contracts, using them on nearly 60 percent of their projects. This shows that private owners recognize the benefits of using cost reimbursable projects on large, complex projects or projects that may be time sensitive. Public owners, on the other hand, used lump sum contracts on 83 percent of their projects in the sample. This clearly reflects the restrictive contracting policies faced by most public contracting agencies that limit them to usage of competitively bid lump sum contracts.

Another departure from commonly held views is the large usage of lump sum remuneration on design-construct projects in the sample. A key benefit of using the design-construct concept noted in the literature review is that construction can start before the design is complete, thus shortening the overall duration. Since a complete and detailed scope of work is not available before construction commences, this type of project is best suited for a cost reimbursable contract. The sample showed, however, that 37 percent of the design-construct

projects used lump sum contracts. This could indicate a desire by owners to place more risk on design-construct contractors, or perhaps willingness by design-construct contractors to accept more risk in order to generate business.

The use of remuneration type in conjunction with project complexity was a surprising departure from commonly held beliefs. CII's own definition states that high complexity projects are characterized by the use of unproven technology, an unusually large number of process steps, large facility size or capacity, new facility configuration or geometry, new construction methods, etc. As project complexity increases, the ability to provide a complete and detailed scope of work becomes more difficult and risk increases. All of these factors would indicate the usage of a cost reimbursable contract, yet the projects in the sample rated as "high" complexity (7 to 10 on a 1 to 10 scale) were split nearly evenly between lump sum and cost reimbursable contracts. These findings might again indicate the desire by owners to place more risk on contractors, or willingness by contractors to accept more risk. It might also reflect a trend by owner organizations to reduce their construction contract administration staffs, thus making them less capable of handling cost reimbursable contracts and more reliant on lump sum contracts, which are easier to administrate.

A possible explanation for these departures from commonly held beliefs is the data sample itself. The project data contained in the CII Benchmarking and metrics database were not obtained by random sample. Instead, CII surveyed member companies to obtain this data. Industrial type projects make up a large majority of the total projects in the sample, and all the projects have a relatively

large dollar value. CII member companies have access to an extensive library of project management and contracting information, and may be more willing to try different contracting schemes besides the old standard of competitively bid lump sum contracts. All of these factors could sway the sample demographics away from the commonplace and expected.

The analysis of the project performance factors for construction projects in the Construction Industry Institute's (CII) Benchmarking and Metrics Database was the primary focus of this research investigation. The project performance factors of cost growth, schedule growth, design-construction overlap on design-build projects (duration ratio), changes and safety were compared for lump sum and cost reimbursable projects in the database. The following hypotheses concerning the effect of contract remuneration on construction project performance factors were stated in Chapter One:

- Contract remuneration type has no effect on construction project cost growth.
- Contract remuneration type has no effect on construction project schedule growth.
- Contract remuneration type has no effect on duration ratio for design-build projects.
- Contract remuneration type has no effect on the number of construction project changes
- Contract remuneration type has no effect on construction project safety.

The analysis brought forth the following results for projects in the sample:

- There was no difference in cost growth between contract remuneration types.
- There was no difference in schedule growth between contract remuneration types.
- There was no difference in duration ratio between contract remuneration types.
- There was no difference in changes between contract remuneration types.
- There was no difference in safety, both Recordable Incident Rate (RIR) and Lost Workday Case Incident Rate (LWCIR), between contract remuneration types.

Without exception, the results of the analysis matched the hypotheses. There are many other issues that affect project performance factors that can come into play on either lump sum or cost reimbursable projects, such as the usage of CII's Best Practices. These appear to have much more influence on project performance factors than the type of contract remuneration used on the project.

In addition to the comparison of means for project performance factors, a comparison of variances using the F-test was also performed on projects in the sample, producing the following results:

- The variance of cost growth for lump sum projects was less than that for cost reimbursable projects.
- There was no difference in the variance of schedule growth between contract remuneration types.
- There was no difference in the variance of duration ratio between contract remuneration types.

- The variance of changes for lump sum projects was less than that for cost reimbursable projects.
- The variance of RIR for cost reimbursable projects was less than that for lump sum projects.
- The variance of LWCIR for cost reimbursable projects was less than that for lump sum projects.

These results indicate better predictability for lump sum projects on cost growth and changes and better predictability for cost reimbursable projects on safety issues. Cost growth and changes are monitored closely on lump sum projects due to their large impact potential, which could explain why the variance for those two performance factors is lower on lump sum projects. There is no ready explanation for why cost reimbursable projects had a lower variance than lump sum projects on safety issues. One possibility is that owners who use cost reimbursable contracts tend to have more sophisticated project management organizations than those that use only lump sum contracts. These more sophisticated organizations may be able to develop better project safety programs, thus resulting in lower variance.

A comparison of private and public lump sum projects in the CII Benchmarking and Metrics Database, using the same project performance factors listed above except duration ratio, produced the following conclusions:

- There is no difference in cost growth between private and public lump sum projects.
- There is no difference in schedule growth between private and public lump sum projects.

- There is no difference in changes between private and public lump sum projects.
- Public lump sum projects have a lower RIR than private lump sum projects
- There is no difference in LWCIR between private and public lump sum projects.

The t-test was performed on the samples for RIR and LWCIR due to the small size of the public lump sum sample. While the t-test showed that the sample means were equal at a 90 percent confidence level for RIR, it also showed that public lump sum projects had a lower mean RIR than private lump sum projects at the 80 percent confidence level. This appears to confirm the results achieved by the z-test.

Other than the difference in RIR, private and public lump sum projects performed similarly on the project performance factors compared. As with the comparison of contract remuneration types, there are other issues that affect project performance factors that can be applied to either private or public lump sum projects. Thus, the factor of the project ownership being private or public does not appear to influence the project performance factors in and of itself.

A variance comparison was also done for private and public lump sum projects in the sample, with the following results:

- The variance of cost growth for public lump sum projects was less than that for private lump sum projects.
- The variance of schedule growth for private lump sum projects was less than that for public lump sum projects.

- The variance of changes for private lump sum projects was less than that for public lump sum projects.
- The variance of RIR for public lump sum projects was less than that for private lump sum projects.
- The variance of LWCIR for public lump sum projects was less than that for private lump sum projects.

The results indicate better predictability for private lump sum projects on schedule growth and changes and better predictability for public lump sum projects on cost growth and safety issues. For private owners, schedule is usually the driving factor in project completion. A greater emphasis on following the schedule would explain a lower variance in schedule growth than for public owners. Public owners, on the other hand, place great emphasis on budget as project funding comes from fixed appropriations and obtaining additional funds for a project is difficult at best, resulting in a lower variance in cost growth. The literature review did not address any reasons for differences in private and public lump sum projects. A possible speculation is that private owners have better record keeping on safety issues than public owners, which results in a larger variance on safety issues. Perhaps future research on this issue will provide a more definitive answer.

Chapter 6: Recommendations

This chapter contains recommendations that are based on the research and analysis conducted in the previous chapters.

The results of the analysis demonstrated that there was no difference in performance factors between lump sum and cost reimbursable projects. The literature review, however, suggested that there should be some differences, particularly in the performance factors of cost growth and changes. Accordingly, it is recommended that analysis similar to that conducted in this thesis be performed periodically, perhaps every three years, to see if any differences in project performance factors do arise between contract remuneration types.

The Construction Industry Institute (CII) has performed a tremendous service by conducting their annual Benchmarking and Metrics Surveys for the past two years. In analyzing the database containing the results of these surveys, two items became apparent. First, many of the survey respondents did not completely fill out their surveys. This resulted in a large amount of potential data that was not collected. Second, it appears that numerous errors were made in transferring the data from the hardcopy surveys to the computer database. This resulted in significant amounts of erroneous data that could not be analyzed. This researcher alone discovered several projects that had erroneous construction schedule data.

Based on these discoveries, the following recommendations are submitted:

- Survey respondents must somehow be more strongly encouraged to completely fill out their surveys.

- A more accurate method of data gathering be utilized for the annual surveys, possibly a computerized survey whose data could be transferred directly from a floppy disk to the database. If this is not possible, a system must be developed to ensure that data is accurately transferred from the surveys to the database.

During the course of this research, it was noted that there is a significant difference in the number of public and private projects. Of the 350 projects analyzed in this thesis, 290 were private projects, as compared to only 60 public projects. If the goal of CII is to focus primarily on private sector projects, then there is no need to change the survey methods used. If, however, CII wants a complete cross-section of construction projects around the country, it is recommended that a greater effort should be made towards gathering data on more public sector projects.

Appendix A: Benchmarking and Metrics Survey Version 2.0 Questions Used in Research Analysis

7. Principal Type of Project (Check only one. If you feel the project does not have a principal type, but is an even mixture of two or more of those listed, please attach a short description of the project. If the project type does not appear in the list, please describe in the space next to "Other."):

Industrial	Infrastructure	Buildings
_____Electrical (Generating)	____Electrical Distribution	____Lowrise Office
_____Oil Exploration/Production	____Highway	____Highrise Office
_____Oil Refining	____Navigation	____Warehouse
_____Pulp and Paper	____Flood Control	____Hospital
_____Chemical Mfg.	____Rail	____Laboratory
_____Environmental	____Water/Wastewater	____School
_____Pharmaceuticals Mfg.	____ Airport	____Prison
_____Metals Refining/Processing	____Tunneling	____Hotel
_____Consumer Products Mfg.	____Mining	____Parking Garage
_____Natural Gas Processing		____Retail
_____Automotive Mfg.		
_____Foods		

_____Other (Please describe)_____

_____

8. This project was (check only one): Grass Roots_____ Modernization _____
Addition _____

Grass roots - a new facility from the foundations and up. A project requiring demolition of an existing facility before new construction begins is also classified as grass roots.

Modernization - a facility for which a substantial amount of the equipment, structure, or other components is replaced or modified, and which may expand capacity and/or improve the process or facility.

Addition - a new addition that ties in to an existing facility, often intended to expand capacity.

_____ Other (Please describe)_____

10. Project Participants. Please list the companies, including your company, that helped execute this project, but do not list any subcontractors. Indicate the function(s) each company performed and the approximate percent of that function to the nearest 10%. For each function, indicate the principle form of remuneration in use at the completion of the work. Please indicate if each participant was an alliance partner and if their contract contained incentives.

Please use the following codes to identify the **Function** performed by each project participant.

PPP	Pre-Project Planner	DM	Demolition/Abatement Contractor
PPC	Pre-Project Planning Consultant	GC	General Contractor
D	Designer	PC	Prime Contractor
PE	Procurement - Equipment	PM	Project Manager
PB	Procurement - Bulks	CM	Construction Manager

Percent of Function refers to the percent of the overall function contributed by the company listed. Estimate to the nearest 10 percent.

Type of Remuneration refers to the overall method of payment. Unit price refers to a price for in place units of work and does not refer to hourly charges for skill categories or time card mark-ups. Hourly rate payment schedules should be categorized as cost reimbursable. Please use the following codes to identify remuneration type. Record the form of remuneration for your own company's contribution, if any, as "I" (In House).

LS	Lump Sum	GP	Guaranteed Maximum Price
UP	Unit Price	I	In-house
CR	Cost Reimbursable/Target Price (Including Incentives)		

An ***Alliance Partner*** is a company with whom your company has a long-term formal strategic agreement that ordinarily covers multiple projects. Circle "Y" to indicate that a company was an alliance partner or circle "N" if the company was not an alliance partner.

If **Contract Incentives** were utilized, please indicate whether those incentives were positive (a financial incentive for attaining an objective), negative (a financial disincentive for failure to achieve an objective), or both. Circle "+" to indicate a positive incentive and circle "-" to indicate a negative incentive.

Company Name	Function	Approx. Percent of Function (Nearest 10%)	Type of Remun. (Contract End)	Was this company an alliance partner? (Yes/No)		Contract Incentives (circle as many as apply)							
						Cost		Schedule		Safety		Quality	
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-
				Y	N	+	-	+	-	+	-	+	-

13. Please indicate the budgeted and actual costs by project phase

- Phase budget amounts should correspond to the estimate at the start of detail design.
- Refer to the table on pages 2 and 3 for phase definitions and typical cost elements.
- State the phase costs in U.S. dollars to the nearest $1000. (You may use a "k" to indicate thousands in lieu of "...,000".)
- Include the cost of bulk materials in construction and the cost of engineered equipment in procurement.
- If this project did not involve Demolition/Abatement or Startup please write "NA" for those phases.
- The sum of phase budgets should equal the Total Project Budget and the sum of actual phase costs should equal Total Actual Project Cost from questions 11 & 12 above.

Project Phase	Phase Budget (Including Contingency)	Amount of Contingency in Budget	Actual Phase Cost
Pre-Project Planning	$	$	$
Detail Design	$	$	$
Procurement	$	$	$
Demolition/Abatement	$	$	$
Construction	$	$	$
Startup	$	$	$
Totals	$	$	$

14. Planned and Actual Project Schedule

- The dates for the planned schedule should be those in effect at the start of detail design. If you cannot provide an exact day for either the planned or actual, estimate to the nearest week in the form mm/dd/yy; for example, 1/8/96, 2/15/96, or 3/22/96.)
- Refer to the chart on pages 2 and 3 for a description of starting and stopping points for each Phase.
- If this project did not involve Demolition/Abatement or Startup please write "NA" for those phases.

Project Phase	Planned Schedule		Actual Schedule	
	Start mm / dd / yy	Stop mm / dd / yy	Start mm / dd / yy	Stop mm / dd / yy
Pre-Project Planning	/ /	/ /	/ /	/ /
Detail Design	/ /	/ /	/ /	/ /
Procurement	/ /	/ /	/ /	/ /
Demolition/Abatement	/ /	/ /	/ /	/ /
Construction	/ /	/ /	/ /	/ /
Startup	/ /	/ /	/ /	/ /

15. ***Project Development Changes*** and ***Scope Changes.*** Please record the changes to your project by phase in the table provided below. For each phase indicate the total number, the net cost impact, and the net schedule impact resulting from project development changes and scope changes. Changes may be initiated by either the owner or contractor.

Project Development Changes include those changes required to execute the original scope of work or obtain original process basis.

Scope Changes include changes in the base scope of work or process basis.

- Changes should be included in the phase in which they were initiated. Refer to the table on pages 2 and 3 to help you decide how to classify the changes by project phase. If you cannot provide the requested change information by phase, but can provide the information for the total project please indicate the totals.

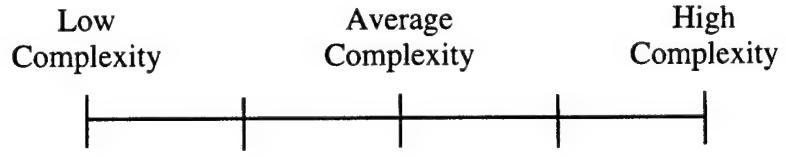
- Indicate "minus" (–) in front of cost or schedule values, if the net changes produced a reduction. If no changes were initiated during a phase, write "0" in the "Total Number" columns.

- State the cost of changes in U.S. dollars to the nearest $1000 and the schedule changes to the nearest week. You may use a "k" to indicate thousands in lieu of "...,000".

Project Phase	Total Number of Project Development Changes	Total Number of Scope Changes	Net Cost Impact of Project Development Changes ($)	Net Cost Impact of Scope Changes ($)	Net Schedule Impact of Project Development Changes (weeks)	Net Schedule Impact of Scope Changes (weeks)
Design			$	$	wks	wks
Procurement			$	$	wks	wks
Demolition/ Abatement			$	$	wks	wks
Construction			$	$	wks	wks
Startup			$	$	wks	wks
Totals			$	$	wks	wks

17b. Project Complexity

Place a mark anywhere on the scale below that best describes the level of complexity for this project as compared to other projects from the same industry sector. For example, if this is a heavy industrial project, how does it compare in complexity to other heavy industrial projects. Use the definitions below the scale as general guidelines.



Low Complexity - Characterized by the use of no unproven technology, small number of process steps, small facility size or process capacity, previously used facility configuration or geometry, proven construction methods, etc.

High Complexity - Characterized by the use of unproven technology, an unusually large number of process steps, large facility size or process capacity, new facility configuration or geometry, new construction methods, etc.

18. Workhours and Accident Data

Please record total craft workhours, the number of recordable injuries, and the number of lost workday cases separately in the spaces provided below.

- Use the U.S. Department of Labor's OSHA definitions for recordable injuries and lost workday cases among this project's craft workers. If you do not track in accordance with these definitions, write "UNK" in the recordable injuries and lost workday cases columns.
- Write "UNK" in any space for which the information is unavailable or incomplete.
- A consolidated project OSHA 200 log is the best source for the data.

Total Craft Workhours	OSHA Recordable Injuries	OSHA Lost Workday Cases

Appendix B: Database for All Lump Sum Data

	A	B	C	D	E	F	G
1	cii_id_a	version	resptype	type	char	publpriv	cnsttype
2	C10	Version 1	Contractor	Oil Refinin(	Grass Roo	Private	UP
3	C100	Version 1	Contractor	Consumer	Add-on	Private	LS
4	C101	Version 1	Contractor	Electrical ((	Grass Roo	Public	LS
5	C102	Version 1	Contractor	Navigation	Modernizat	Public	LS
6	C103	Version 1	Contractor	Electrical ((	Modernizat	Private	LS
7	C107	Version 1	Contractor	Highway	Add-on	Public	UP
8	C111	Version 1	Contractor	Parking Ga	Grass Roo	Public	LS
9	C113	Version 1	Contractor	Highway	Grass Roo	Public	LS
10	C114	Version 1	Contractor	Airport	Grass Roo	Public	LS
11	C116	Version 1	Contractor	Water/Was	Add-on	Public	LS
12	C118	Version 1	Contractor	Hospital	Grass Roo	Public	LS
13	C125	Version 1	Contractor	Oil Refinin(	Add-on	Private	LS
14	C128	Version 2	Contractor	Pulp and P	Add-on	Private	LS
15	C135	Version 2	Contractor	Oil Explora	Grass Roo	Private	LS
16	C137	Version 2	Contractor	Oil Refinin(	Add-on	Private	LS
17	C141	Version 2	Contractor	Electrical ((	Modernizat	Private	LS
18	C143	Version 2	Contractor	Consumer	Add-on	Private	LS
19	C144	Version 2	Contractor	Water/Was	Modernizat	Private	LS
20	C146	Version 2	Contractor	Electrical ((	Modernizat	Private	LS
21	C148	Version 2	Contractor	Pulp and P	Add-on	Private	LS
22	C149	Version 2	Contractor	Environme	Modernizat	Private	LS
23	C151	Version 2	Contractor	Chemical M	Add-on	Private	LS
24	C152	Version 2	Contractor	Pulp and P	Modernizat	Private	LS
25	C156	Version 2	Contractor	Telecommı	Modernizat	Private	LS
26	C162	Version 2	Contractor	Oil Refinin(	Grass Roo	Private	LS
27	C172	Version 2	Contractor	Oil Refinin(	Add-on	Private	LS
28	C176	Version 2	Contractor	Chemical M	Add-on	Private	LS
29	C177	Version 2	Contractor	Warehouse	Grass Roo	Private	LS
30	C178	Version 2	Contractor	Office Proc	Add-on	Private	LS
31	C179	Version 2	Contractor	Chemical M	Grass Roo	Private	LS
32	C180	Version 2	Contractor	Environme	Modernizat	Private	LS
33	C183	Version 2	Contractor	Highway	Add-on	Public	UP
34	C184	Version 2	Contractor	Highway	Modernizat	Public	UP
35	C185	Version 2	Contractor	Electrical ((	Add-on	Private	LS
36	C189	Version 2	Contractor	Rail	Add-on	Private	LS
37	C190	Version 2	Contractor	Flood Cont	Modernizat	Private	LS
38	C2	Version 1	Contractor	Electrical ((	Add-on	Private	LS
39	C20	Version 1	Contractor	Oil Refinin(	Grass Roo	Private	LS
40	C205	Version 2	Contractor	Natural Ga	Grass Roo	Private	LS
41	C206	Version 2	Contractor	Oil Refinin(	Grass Roo	Private	LS
42	C207	Version 2	Contractor	Oil Refinin(	Grass Roo	Private	LS
43	C208	Version 2	Contractor	Chemical M	Grass Roo	Private	LS
44	C209	Version 2	Contractor	Oil Refinin(	Grass Roo	Private	LS

	H	I	J	K	L	M	N
1	desncnst	budcscon	actcscon	concstgro	%cncsgro	plncon_s	plncon_f
2	Constructic	17814000	22200000	4386000	24.62108	9/13/93	10/31/94
3	Design anc	58239000	65325000	7086000	12.1671	10/15/92	12/31/93
4	Constructic	6968000	8684000	1716000	24.62687	3/17/94	11/30/94
5	Constructic	11693000	17657000	5964000	51.00487	9/13/93	4/30/96
6	Design anc	2964000	3929000	965000	32.55735	10/8/94	12/15/95
7	Constructic	20080000	20937000	857000	4.267928	7/3/92	10/27/94
8	Design anc	9521000	10475000	954000	10.01996	8/1/94	1/21/96
9	Constructic	1.36E+08	1.41E+08	5000000	3.676471	9/29/93	3/30/96
10	Constructic	17789000	18469000	680000	3.822587	5/9/94	9/20/95
11	Constructic	84734000	1E+08	15385000	18.15682	3/15/92	6/15/96
12	Constructic	53531000	63703000	10172000	19.00207	7/24/91	9/17/93
13	Design anc	45630000	53793000	8163000	17.88955	11/1/94	1/1/96
14	Design anc	48120067	32241855	-15878212	-32.99707	11/16/94	5/1/96
15	Design anc	73620000	76382000	2762000	3.751698	1/1/93	10/31/94
16	Design anc	29912000	48934000	19022000	63.59321	5/15/95	9/2/97
17	Design anc	1426000	1297000	-129000	-9.046283	9/16/96	10/16/96
18	Design Onl	221000	237000	16000	7.239819	9/1/93	6/1/94
19	Constructic	6678669	8645823	1967154	29.45428	10/22/94	2/14/96
20	Constructic	4230425	4651263	420838	9.947889	9/18/95	5/4/96
21	Design anc	1.49E+08	1.5E+08	684000	0.459002	7/5/94	12/15/95
22	Design anc	13052000	19334000	6282000	48.13055	11/13/95	11/20/96
23	Design anc	15509000	20872000	5363000	34.57992	11/20/95	12/31/96
24	Design anc	9137019	10088217	951198	10.41038	2/20/95	10/1/96
25	Design anc	4800000	4550000	-250000	-5.208333	11/1/94	12/31/95
26	Design anc	23000000	-888	-23000888	-100.0039	5/1/94	9/30/95
27	Design anc	4603000	5305000	702000	15.25092	2/15/96	8/31/96
28	Design anc	20700000	20700000	0	0	10/1/95	12/31/96
29	Design anc	11525060	13043683	1518623	13.1767	11/1/94	5/30/95
30	Design anc	9450000	10381000	931000	9.851852	4/1/94	12/22/94
31	Design anc	11800000	12600000	800000	6.779661	4/1/94	1/15/95
32	Constructic	1438000	3186000	1748000	121.5577	8/28/96	2/7/97
33	Constructic	17739000	19178000	1439000	8.112069	8/31/95	2/15/97
34	Constructic	10182000	7303000	-2879000	-28.27539	10/14/96	6/18/98
35	Constructic	27766400	21265000	-6501400	-23.41463	6/1/94	6/1/96
36	Design anc	35071000	44717000	9646000	27.50421	4/26/93	4/6/95
37	Design anc	3200000	3300000	100000	3.125	4/15/96	4/10/97
38	Design anc	6116804	10726708	4609904	75.36459	2/1/94	12/31/94
39	Constructic	11100000	12300000	1200000	10.81081	10/1/93	9/1/94
40	Design anc	3E+08	2.7E+08	-30000000	-10	8/1/93	2/28/97
41	Design anc	1.82E+08	1.42E+08	-40000000	-21.97802	12/15/92	9/15/94
42	Design anc	1.72E+08	1.89E+08	17000000	9.883721	10/1/94	3/31/96
43	Design anc	1.02E+08	1.07E+08	5300000	5.221675	2/1/94	7/20/95
44	Design anc	48000000	50000000	2000000	4.166667	12/1/92	8/29/94

	O	P	Q	R	S	T	U
1	actcon_s	actcon_f	nochgcon	complexity	crftwkhrs	rics	lwcs
2	9/13/93	9/9/09	540		362700	14	0
3	10/2/92	9/9/09	89		671368	24	0
4	3/17/94	9/9/09	115		256000	4	0
5	9/13/93	9/9/09	36		170794	2	0
6	10/8/94	9/9/09	24		60729	-975	-999
7	7/3/92	9/9/09	10		562417	6	1
8	8/28/94	4/3/96	44		72398	3	1
9	9/29/93	9/29/95	30		1857054	91	17
10	5/30/94	8/30/95	68		17651	-998	-998
11	5/15/92	12/28/95	46		539104	-963	-974
12	7/24/91	3/23/94	164		745560	12	9
13	2/1/95	1/5/96	10		461000	4	0
14	11/1/94	7/7/07	0		2696728	54	5
15	1/1/93	7/7/07	102		4667634	6	3
16	5/15/95	7/7/07	25		1276399	7	0
17	9/12/96	7/7/07	15		29694	0	0
18	9/1/93	7/7/07	32		49223	-775	-776
19	10/22/94	7/7/07	226		109913	3	0
20	9/18/95	7/7/07	17		52000	0	0
21	6/20/94	12/15/95	36		3709112	-841	-885
22	11/13/95	1/6/97	15		345885	32	5
23	11/20/95	12/13/96	15		377000	11	3
24	2/20/95	10/1/96	79		182718	4	0
25	4/1/95	4/15/96	32		110000	8	0
26	5/1/94	2/15/96	2		1300000	6	0
27	3/11/96	10/7/96	9		55820	0	0
28	10/7/95	7/26/96	15		630000	1	0
29	11/1/94	7/31/95	12		-888	-888	-888
30	4/21/94	2/24/95	17		-888	-888	-888
31	4/1/94	5/15/95	13		-888	-888	-888
32	9/9/96	2/14/97	21		67450	0	0
33	8/31/95	10/1/96	72		230359	-882	-887
34	10/14/96	10/7/96	-1776		14450	0	0
35	6/1/94	10/9/96	-1776		602000	14	0
36	4/26/93	12/12/96	451		498112	-833	-884
37	4/15/96	12/12/96	42		45500	0	0
38	2/1/94	12/31/94	10		320394	2	0
39	10/1/93	5/29/94	630		190000	0	0
40	8/25/93	1/28/97	47		56413201	509	34
41	1/15/93	2/11/97	11		2379000	-888	1
42	10/1/94	2/14/97	212		1800000	-888	2
43	4/1/94	2/28/97	-1776		2231000	-888	3
44	12/15/92	3/15/97	14	5	2048000	3	2

	V	W
1	RIR	LWCIR
2	7.719879	0
3	7.149581	0
4	3.125	0
5	2.342003	0
6	-3210.987	-3290.026
7	2.133648	0.355608
8	8.287522	2.762507
9	9.800469	1.830857
10	-11308.14	-11308.14
11	-357.2595	-361.3403
12	3.219057	2.414293
13	1.735358	0
14	4.004853	0.37082
15	0.25709	0.128545
16	1.096836	0
17	0	0
18	-3148.934	-3152.998
19	5.458863	0
20	0	0
21	-45.34778	-47.72032
22	18.50326	2.891134
23	5.835544	1.591512
24	4.378332	0
25	14.54545	0
26	0.923077	0
27	0	0
28	0.31746	0
29	200000	200000
30	200000	200000
31	200000	200000
32	0	0
33	-765.7613	-770.1023
34	0	0
35	4.651163	0
36	-334.4629	-354.9403
37	0	0
38	1.248463	0
39	0	0
40	1.804542	0.120539
41	-74.65322	0.084069
42	-98.66667	0.222222
43	-79.60556	0.268938
44	0.292969	0.195313

	A	B	C	D	E	F	G
45	C210	Version 2	Contractor	Oil Refinin(	Grass Roo	Private	LS
46	C211	Version 2	Contractor	Chemical M	Grass Roo	Private	LS
47	C216	Version 2	Contractor	Chemical M	Add-on	Private	LS
48	C28	Version 1	Contractor	Flood Cont	Modernizat	Public	UP
49	C29	Version 1	Contractor	Electrical ((	Grass Roo	Private	LS
50	C3	Version 1	Contractor	Airport	Add-on	Public	LS
51	C30	Version 1	Contractor	Environme	Add-on	Private	LS
52	C4	Version 1	Contractor	Highway	Add-on	Public	UP
53	C41	Version 1	Contractor	Oil Refinin(	Add-on	Private	LS
54	C44	Version 1	Contractor	Electrical ((	Grass Roo	Private	LS
55	C45	Version 1	Contractor	Flood Cont	Modernizat	Public	LS
56	C46	Version 1	Contractor	Highway	Modernizat	Public	UP
57	C47	Version 1	Contractor	Highway	Grass Roo	Public	UP
58	C48	Version 1	Contractor	Tunneling	Modernizat	Private	UP
59	C49	Version 1	Contractor	Highway	Modernizat	Public	LS
60	C5	Version 1	Contractor	Highway	Modernizat	Public	UP
61	C50	Version 1	Contractor	Highway	Modernizat	Public	UP
62	C52	Version 1	Contractor	Highway	Modernizat	Public	UP
63	C58	Version 1	Contractor	Chemical M	Grass Roo	Private	LS
64	C6	Version 1	Contractor	Pulp and P	Grass Roo	Private	LS
65	C60	Version 1	Contractor	Chemical M	Grass Roo	Private	LS
66	C66	Version 1	Contractor	Chemical M	Modernizat	Private	LS
67	C68	Version 1	Contractor	Chemical M	Add-on	Private	LS
68	C69	Version 1	Contractor	Oil Refinin(	Add-on	Private	LS
69	C70	Version 1	Contractor	Chemical M	Grass Roo	Private	LS
70	C72	Version 1	Contractor	Laboratory	Grass Roo	Private	LS
71	C73	Version 1	Contractor	Chemical M	Grass Roo	Private	LS
72	C76	Version 1	Contractor	Metals Ref	Grass Roo	Private	LS
73	C79	Version 1	Contractor	Oil Refinin(	Grass Roo	Private	LS
74	C8	Version 1	Contractor	Pulp and P	Grass Roo	Private	LS
75	C83	Version 1	Contractor	Consumer	Add-on	Private	LS
76	C87	Version 1	Contractor	Pulp and P	Modernizat	Private	LS
77	C89	Version 1	Contractor	Automotive	Add-on	Private	LS
78	C9	Version 1	Contractor	Pulp and P	Add-on	Private	LS
79	C91	Version 1	Contractor	School	Grass Roo	Public	LS
80	C92	Version 1	Contractor	Pulp and P	Modernizat	Private	LS
81	C98	Version 1	Contractor	Oil Refinin(	Add-on	Private	LS
82	O1	Version 1	Owner	Dormatory/	Grass Roo	Public	LS
83	O10	Version 1	Owner	Electrical ((	Modernizat	Private	LS
84	O103	Version 2	Owner	Water/Was	Modernizat	Private	LS
85	O11	Version 1	Owner	Water/Was	Add-on	Private	LS
86	O112	Version 2	Owner	Metals Ref	Modernizat	Private	LS
87	O114	Version 2	Owner	Chemical M	Add-on	Private	LS
88	O116	Version 2	Owner	Chemical M	Grass Roo	Private	LS

	H	I	J	K	L	M	N
45	Design anc	18000000	31000000	13000000	72.22222	4/1/93	10/31/94
46	Constructic	14036000	13343000	-693000	-4.937304	8/1/93	2/28/95
47	Constructic	4744000	4439000	-305000	-6.429174	9/21/96	12/16/96
48	Constructic	95301000	1.14E+08	18383000	19.28941	9/28/91	8/1/95
49	Constructic	18847000	20995000	2148000	11.39704	4/15/92	5/15/93
50	Constructic	7399000	7600000	201000	2.716583	11/1/93	5/30/95
51	Design anc	14679000	15594000	915000	6.233395	10/1/94	4/1/96
52	Constructic	21993054	25161000	3167946	14.4043	12/2/91	8/27/94
53	Design anc	35326000	35326000	0	0	10/1/93	10/26/95
54	Design anc	14133000	13527000	-606000	-4.287837	5/1/95	3/11/96
55	Constructic	29970000	36210000	6240000	20.82082	4/15/92	6/30/95
56	Constructic	31760000	40147000	8387000	26.40743	6/15/92	1/15/96
57	Constructic	64783000	72611000	7828000	12.08342	10/1/92	11/15/94
58	Constructic	9300000	15125000	5825000	62.63441	1/20/94	12/28/94
59	Constructic	13628000	15455000	1827000	13.40622	1/26/94	3/11/95
60	Constructic	8388000	9661000	1273000	15.17644	10/6/92	8/6/94
61	Constructic	22185980	24264844	2078864	9.37017	10/26/92	12/19/94
62	Constructic	22343000	24038000	1695000	7.586269	12/6/93	3/7/96
63	Design anc	46100000	47300000	1200000	2.603037	8/15/89	3/15/91
64	Design anc	1.18E+08	1.04E+08	-13400000	-11.38488	11/1/93	3/1/95
65	Design anc	34000000	39600000	5600000	16.47059	3/15/91	4/30/92
66	Design anc	3620000	3358000	-262000	-7.237569	9/1/93	3/15/95
67	Design anc	17800000	15800000	-2000000	-11.23596	8/15/92	11/15/93
68	Constructic	10371000	17399000	7028000	67.76589	6/24/92	6/1/93
69	Constructic	3792000	4717000	925000	24.39346	5/9/94	5/31/95
70	Constructic	7292000	10139000	2847000	39.04279	12/17/90	8/21/92
71	Constructic	1330000	1484000	154000	11.57895	12/6/93	5/13/94
72	Design anc	20422000	20419000	-3000	-0.01469	8/26/94	8/31/95
73	Constructic	30146000	30160000	14000	0.046441	1/1/92	11/30/93
74	Design anc	68760000	68643000	-117000	-0.170157	10/15/93	12/15/94
75	Design anc	1725000	2244000	519000	30.08696	1/2/96	3/11/96
76	Constructic	2411000	2802000	391000	16.21734	7/31/95	2/5/96
77	Design anc	14203000	14379000	176000	1.239175	10/1/93	9/1/94
78	Design anc	74132000	74134000	2000	0.002698	11/1/93	5/1/95
79	Constructic	7084000	7593000	509000	7.185206	5/10/94	8/20/95
80	Design anc	46339000	58719000	12380000	26.71616	10/1/94	3/3/96
81	Design anc	3298000	3259000	-39000	-1.182535	5/1/95	12/22/95
82	No	18373000	18873000	500000	2.721385	10/1/93	12/22/94
83	No	9512000	7926000	-1586000	-16.67368	7/1/94	7/7/95
84	No	11480000	12665000	1185000	10.3223	2/13/95	2/29/96
85	No	5250000	18164000	12914000	245.981	9/9/09	9/9/09
86	No	27605000	24630000	-2975000	-10.77703	6/1/92	2/16/94
87	Yes	7353000	8207000	854000	11.61431	10/1/94	11/30/95
88	No	12718000	16898000	4180000	32.8668	3/1/95	3/30/96

	O	P	Q	R	S	T	U
45	4/1/93	10/15/94	4	9.5	845000	1	0
46	8/1/93	3/27/97	0	2.5	564000	-888	0
47	9/21/96	12/16/96	0	5	120000	0	0
48	4/19/91	8/28/94	600	5.5	1950984	62	17
49	4/15/92	8/31/94	350	5.5	374000	15	6
50	11/1/93	9/1/94	19	5	129915	10	1
51	7/1/94	3/15/96	3	9.5	330000	0	0
52	12/2/91	12/30/94	12	9.5	125296	-995	-998
53	10/1/93	12/31/94	0	5	767628	5	0
54	6/2/95	2/1/96	9	7	206800	5	0
55	4/15/92	1/30/95	146	3	463701	-974	-996
56	6/15/92	2/28/95	250	5	469001	-983	-995
57	10/1/92	3/8/95	65	8	625932	-953	-992
58	1/20/94	3/15/95	32	9.5	228300	-984	-990
59	1/26/94	4/3/95	38	5.5	70996	-994	-996
60	10/6/92	4/8/95	20	10	48183	-998	-999
61	11/2/92	4/12/95	6	5	335385	-1998	-1998
62	12/6/93	4/21/95	13	5	347053	-990	-997
63	11/9/89	4/26/91	2	5	2103400	114	3
64	11/1/93	8/1/95	0	7.5	591001	-990	-998
65	4/16/91	6/30/92	33	5	1512402	44	1
66	9/1/93	9/15/95	20	5	69836	0	0
67	5/15/92	10/9/95	141	2.5	382000	3	1
68	8/20/92	6/11/93	9	9	237043	-1998	-999
69	5/9/94	10/15/95	-999	7	92239	-995	-999
70	2/26/91	11/21/95	18	1.5	294841	-996	-999
71	12/13/93	5/29/94	2	3.5	17924	-998	-999
72	10/5/94	12/4/95	35	7.5	396000	3	2
73	1/1/92	1/5/96	33	5	645000	0	0
74	10/15/93	1/6/96	0	4	515210	28	5
75	1/2/96	3/11/96	95	5	35000	1	0
76	7/31/95	3/15/96	72	8	66800	1	0
77	10/1/93	3/26/96	103	7.5	146594	5	2
78	11/1/93	3/28/96	35	8	2294001	-935	-991
79	6/15/94	4/15/96	47	7.5	66500	2	2
80	10/1/94	4/15/96	1	5	1187531	45	1
81	6/26/95	8/30/96	20	6.5	-1998	-1998	-1998
82	10/15/93	3/15/95	57	7	275953	0	0
83	6/1/94	3/15/95	95	5	85423	0	0
84	1/27/95	6/22/96	0	5	188016	2	-999
85	11/1/92	3/30/94	-999	5	189500	17	4
86	6/1/92	2/16/94	-1776	6.5	174349	14	1
87	10/1/94	11/30/95	0	9	88400	1	1
88	5/1/95	5/30/96	-1776	10	455000	3	1

	V	W
45	0.236686	0
46	-314.8936	0
47	0	0
48	6.355767	1.74271
49	8.02139	3.208556
50	15.39468	1.539468
51	0	0
52	-1588.239	-1593.028
53	1.302714	0
54	4.83559	0
55	-420.0983	-429.5872
56	-419.1889	-424.3061
57	-304.5059	-316.9673
58	-862.0237	-867.2799
59	-2800.158	-2805.792
60	-4142.54	-4146.691
61	-1191.467	-1191.467
62	-570.518	-574.552
63	10.83959	0.285252
64	-335.0248	-337.7321
65	5.818559	0.13224
66	0	0
67	1.570681	0.52356
68	-1685.77	-842.885
69	-2157.439	-2166.112
70	-675.6184	-677.6534
71	-11135.91	-11147.07
72	1.515152	1.010101
73	0	0
74	10.86935	1.940956
75	5.714286	0
76	2.994012	0
77	6.821562	2.728625
78	-81.51697	-86.39926
79	6.015038	6.015038
80	7.57875	0.168417
81	200000	200000
82	0	0
83	0	0
84	2.127479	-1062.676
85	17.94195	4.221636
86	16.05974	1.147124
87	2.262443	2.262443
88	1.318681	0.43956

	A	B	C	D	E	F	G
89	O119	Version 2	Owner	Maintenan	Grass Roo	Public	LS
90	O120	Version 2	Owner	Lowrise Of	Grass Roo	Public	LS
91	O121	Version 2	Owner	Lowrise Of	Grass Roo	Public	LS
92	O124	Version 2	Owner	Pharmaceu	Grass Roo	Private	LS
93	O126	Version 2	Owner	Pharmaceu	Modernizat	Private	LS
94	O128	Version 2	Owner	Pharmaceu	Grass Roo	Private	LS
95	O131	Version 2	Owner	Electrical (	Modernizat	Public	LS
96	O134	Version 2	Owner	Automotive	Add-on	Private	LS
97	O135	Version 2	Owner	Automotive	Add-on	Private	LS
98	O136	Version 2	Owner	Foods	Grass Roo	Private	LS
99	O137	Version 2	Owner	Lowrise Of	Modernizat	Private	LS
100	O138	Version 2	Owner	Chemical M	Grass Roo	Private	LS
101	O139	Version 2	Owner	Chemical M	Modernizat	Private	LS
102	O140	Version 2	Owner	Water/Was	Grass Roo	Public	LS
103	O142	Version 2	Owner	Lowrise Of	Add-on	Public	LS
104	O144	Version 2	Owner	Electrical (	Modernizat	Public	LS
105	O145	Version 2	Owner	Pulp and P	Add-on	Private	LS
106	O149	Version 2	Owner	Pulp and P	Grass Roo	Private	LS
107	O152	Version 2	Owner	Pulp and P	Add-on	Private	LS
108	O153	Version 2	Owner	Electrical (	Add-on	Private	LS
109	O154	Version 2	Owner	Warehouse	Add-on	Private	LS
110	O155	Version 2	Owner	Foods	Modernizat	Private	LS
111	O158	Version 2	Owner	Lowrise Of	Grass Roo	Private	LS
112	O159	Version 2	Owner	Chemical M	Add-on	Private	LS
113	O166	Version 2	Owner	Oil Refinin	Add-on	Private	LS
114	O171	Version 2	Owner	Electrical D	Modernizat	Private	LS
115	O174	Version 2	Owner	Oil Refinin	Add-on	Private	LS
116	O177	Version 2	Owner	Hospital	Add-on	Public	LS
117	O178	Version 2	Owner	School	Grass Roo	Public	LS
118	O180	Version 2	Owner	School	Grass Roo	Public	LS
119	O182	Version 2	Owner	School	Modernizat	Public	LS
120	O183	Version 2	Owner	School	Grass Roo	Public	LS
121	O184	Version 2	Owner	Maintenan	Add-on	Public	LS
122	O185	Version 2	Owner	Highrise O	Grass Roo	Public	LS
123	O186	Version 2	Owner	Laboratory	Grass Roo	Public	LS
124	O187	Version 2	Owner	Restaurant	Grass Roo	Public	LS
125	O19	Version 1	Owner	Water/Was	Add-on	Private	LS
126	O190	Version 2	Owner	Dormatory/	Grass Roo	Public	LS
127	O191	Version 2	Owner	Dormatory/	Grass Roo	Public	LS
128	O192	Version 2	Owner	Chemical M	Add-on	Private	UP
129	O193	Version 2	Owner	Chemical M	Modernizat	Private	UP
130	O194	Version 2	Owner	Chemical M	Modernizat	Private	UP
131	O195	Version 2	Owner	Consumer	Modernizat	Private	UP
132	O2	Version 1	Owner	Laboratory	Grass Roo	Public	LS

	H	I	J	K	L	M	N
89	No	4800000	6022000	1222000	25.45833	2/15/90	4/15/91
90	No	9000000	8415000	-585000	-6.5	9/9/09	9/9/09
91	No	-888	-888	0	0	8/8/08	8/8/08
92	No	74231000	79808000	5577000	7.513034	7/1/92	10/1/95
93	No	95000000	90000000	-5000000	-5.263158	1/1/93	8/1/94
94	Yes	24500000	24100000	-400000	-1.632653	8/1/95	2/28/96
95	Unk	9387000	14890000	5503000	58.62363	2/1/94	4/30/94
96	Unk	18000000	22000000	4000000	22.22222	12/1/96	7/1/97
97	No	36030000	34280000	-1750000	-4.857064	10/1/95	7/1/97
98	No	39567620	42375430	2807810	7.096232	4/1/94	7/1/96
99	No	10599600	6078700	-4520900	-42.65161	2/1/95	2/1/96
100	No	29100000	27400000	-1700000	-5.841924	8/1/95	11/30/96
101	No	7400000	7250000	-150000	-2.027027	10/1/95	9/1/96
102	No	9688000	9387000	-301000	-3.106936	9/29/88	1/10/91
103	No	5600000	5553877	-46123	-0.823625	3/30/94	12/19/95
104	No	6888000	5436000	-1452000	-21.08014	6/26/95	8/23/96
105	No	4685000	3418000	-1267000	-27.04376	5/15/95	12/15/95
106	No	3548000	3930000	382000	10.76663	10/17/94	2/6/96
107	No	4251000	3750000	-501000	-11.78546	5/24/96	11/4/96
108	Yes	-888	-888	0	0	10/15/95	12/15/96
109	No	10232300	10955723	723423	7.069994	3/9/95	4/28/96
110	No	34937000	40291000	5354000	15.32473	11/30/94	2/1/97
111	No	11125000	12007000	882000	7.92809	11/15/95	12/15/96
112	No	3312000	-888	-3312888	-100.0268	3/10/97	6/20/97
113	No	78882000	1.42E+08	63361000	80.32377	9/15/95	12/17/96
114	No	-888	4100000	4100888	-461811.7	8/8/08	8/8/08
115	No	11800000	9780000	-2020000	-17.11864	8/8/08	8/8/08
116	No	22050000	23050000	1000000	4.535147	3/4/93	4/21/95
117	No	14688000	14771000	83000	0.565087	1/19/95	6/17/96
118	No	9910000	11450000	1540000	15.53986	9/15/95	3/31/97
119	No	19758000	22315000	2557000	12.94159	2/1/96	8/1/97
120	No	15611000	15906000	295000	1.889693	8/8/08	8/8/08
121	No	21000000	15677000	-5323000	-25.34762	6/30/91	7/30/94
122	No	69700000	73025000	3325000	4.770445	1/3/95	9/9/09
123	No	26455000	27168000	713000	2.695143	3/21/94	2/22/96
124	No	6542000	6774000	232000	3.546316	9/20/93	12/20/94
125	No	23600000	21100000	-2500000	-10.59322	7/30/94	12/31/95
126	No	2.75E+08	2.6E+08	-15070000	-5.472041	1/15/95	9/30/96
127	No	8668000	8227000	-441000	-5.087679	10/30/94	12/30/95
128	No	1091680	2008118	916438	83.94749	8/15/95	5/15/96
129	No	1959000	2294000	335000	17.10056	8/8/08	6/30/96
130	No	39796661	54123000	14326339	35.99885	8/8/08	8/8/08
131	No	5800000	6280000	480000	8.275862	2/1/96	8/1/96
132	No	55089000	65132000	10043000	18.2305	9/15/91	9/15/93

	O	P	Q	R	S	T	U
89	7/30/90	11/22/91	33	2.5	40000	0	0
90	9/9/09	9/9/09	40		60000	1	1
91	9/30/91	11/4/92	-1776		72254	0	0
92	7/1/92	4/30/96	58		1110000	57	6
93	1/1/93	2/1/96	-1776		1000000	63	9
94	8/1/95	4/25/96	1		250000	2	0
95	10/29/94	3/12/95	-1776		-888	-888	-888
96	12/1/96	7/1/97	20		-888	1	1
97	12/1/95	7/1/97	-1776		375700	2	0
98	5/1/94	3/15/97	708		521000	0	0
99	3/1/95	1/1/96	92		112000	0	0
100	8/1/95	12/10/96	-1776		33110	-888	-888
101	10/1/95	9/30/96	-1776		500000	2	0
102	11/9/88	5/9/91	-833		194000	0	0
103	3/30/94	3/21/96	0		50000	0	0
104	6/26/95	8/23/96	72		-888	-888	-888
105	5/15/95	3/15/96	62		-888	0	0
106	10/17/94	1/31/96	-1776		30000	0	0
107	5/24/96	11/4/96	4		27649	2	0
108	10/15/95	1/15/97	42		103100	1	0
109	3/9/95	4/28/96	26		24043	1	0
110	11/30/94	4/1/97	-1776		1200000	5	2
111	10/15/95	4/15/97	298		184000	0	0
112	3/24/97	8/8/08	961		936093	23	2
113	9/15/95	3/17/97	-1776		98850	0	0
114	1/15/93	12/15/96	-1776		-888	-888	-888
115	10/12/91	11/15/92	-1776		3348553	29	4
116	3/4/93	4/20/97	-1776		-888	-888	-888
117	1/19/95	6/30/96	200		98000	0	0
118	3/1/95	4/16/97	-1776		-888	0	0
119	2/5/96	9/1/97	-1776		-888	0	0
120	2/21/96	7/31/97	-1776		-888	-888	-888
121	6/14/91	12/21/93	-992		-888	-888	-888
122	1/25/95	2/17/97	97		-888	-888	-888
123	3/22/94	4/6/96	-880		-888	-888	-888
124	8/30/93	5/3/95	105		-888	-888	-888
125	8/19/94	12/15/95	15		69000	5	0
126	2/28/95	9/30/96	40		-888	-888	-888
127	10/26/95	11/30/96	70		-888	-888	-888
128	9/15/95	5/15/96	40		-888	-888	-888
129	8/8/08	6/30/96	43		-888	-888	-888
130	3/15/95	7/15/96	50		-888	-888	-888
131	5/1/96	4/1/97	0		-888	-888	-888
132	10/21/91	4/29/94	123		275000	2	2

	V	W
89	0	0
90	3.333333	3.333333
91	0	0
92	10.27027	1.081081
93	12.6	1.8
94	1.6	0
95	200000	200000
96	-225.2252	-225.2252
97	1.064679	0
98	0	0
99	0	0
100	-5363.938	-5363.938
101	0.8	0
102	0	0
103	0	0
104	200000	200000
105	0	0
106	0	0
107	14.46707	0
108	1.939864	0
109	8.318429	0
110	0.833333	0.333333
111	0	0
112	4.914042	0.427308
113	0	0
114	200000	200000
115	1.732091	0.238909
116	200000	200000
117	0	0
118	0	0
119	0	0
120	200000	200000
121	200000	200000
122	200000	200000
123	200000	200000
124	200000	200000
125	14.49275	0
126	200000	200000
127	200000	200000
128	200000	200000
129	200000	200000
130	200000	200000
131	200000	200000
132	1.454545	1.454545

	A	B	C	D	E	F	G
133	O20	Version 1	Owner	Pulp and P	Modernizat	Private	LS
134	O21	Version 1	Owner	Pulp and P	Add-on	Private	LS
135	O23	Version 1	Owner	Chemical M	Grass Roo	Private	LS
136	O24	Version 1	Owner	Chemical M	Modernizat	Private	LS
137	O27	Version 1	Owner	Pulp and P	Modernizat	Private	LS
138	O29	Version 1	Owner	Laboratory	Modernizat	Public	LS
139	O3	Version 1	Owner	Marine Fac	Modernizat	Public	LS
140	O30	Version 1	Owner	Lowrise Of	Modernizat	Public	LS
141	O31	Version 1	Owner	Lowrise Of	Grass Roo	Public	LS
142	O32	Version 1	Owner	Lowrise Of	Modernizat	Public	LS
143	O33	Version 1	Owner	Laboratory	Grass Roo	Private	LS
144	O35	Version 1	Owner	Pharmaceu	Add-on	Private	LS
145	O36	Version 1	Owner	Pharmaceu	Modernizat	Private	LS
146	O37	Version 1	Owner	Metals Ref	Modernizat	Private	LS
147	O39	Version 1	Owner	Automotive	Modernizat	Private	LS
148	O4	Version 1	Owner	Maintenan	Grass Roo	Public	LS
149	O40	Version 1	Owner	Automotive	Add-on	Private	LS
150	O44	Version 1	Owner	Oil Refinin	Modernizat	Private	LS
151	O45	Version 1	Owner	Lowrise Of	Grass Roo	Public	LS
152	O47	Version 1	Owner	Natural Ga	Grass Roo	Private	LS
153	O48	Version 1	Owner	Natural Ga	Grass Roo	Private	LS
154	O49	Version 1	Owner	Electrical (	Grass Roo	Private	LS
155	O5	Version 1	Owner	Hospital	Grass Roo	Public	LS
156	O50	Version 1	Owner	Natural Ga	Add-on	Private	LS
157	O51	Version 1	Owner	Natural Ga	Grass Roo	Private	LS
158	O53	Version 1	Owner	Chemical M	Modernizat	Private	LS
159	O55	Version 1	Owner	Chemical M	Add-on	Private	LS
160	O56	Version 1	Owner	Chemical M	Add-on	Private	LS
161	O57	Version 1	Owner	Chemical M	Add-on	Private	LS
162	O58	Version 1	Owner	Warehouse	Add-on	Private	LS
163	O59	Version 1	Owner	Water/Was	Add-on	Private	LS
164	O60	Version 1	Owner	Maintenan	Grass Roo	Private	LS
165	O61	Version 1	Owner	Water/Was	Modernizat	Private	LS
166	O68	Version 1	Owner	Electrical (	Grass Roo	Private	LS
167	O78	Version 1	Owner	Environme	Modernizat	Private	LS
168	O80	Version 1	Owner	Pulp and P	Modernizat	Private	LS
169	O87	Version 1	Owner	Water/Was	Modernizat	Public	LS

	H	I	J	K	L	M	N
133	No	2900000	2447000	-453000	-15.62069	9/19/94	12/22/94
134	No	2253000	1974000	-279000	-12.38349	7/1/94	5/15/95
135	No	23076000	26576000	3500000	15.16727	3/15/95	1/15/96
136	No	7245000	7553000	308000	4.251208	3/15/94	2/15/95
137	No	19009000	15015000	-3994000	-21.0111	1/20/93	10/9/95
138	No	5000000	5000000	0	0	7/9/93	1/1/95
139	No	12692000	14532000	1840000	14.49732	9/9/09	9/9/09
140	No	5700000	5650000	-50000	-0.877193	7/1/92	7/1/94
141	No	42300000	40026000	-2274000	-5.375887	4/30/92	4/1/94
142	No	6330000	7080000	750000	11.84834	9/1/90	10/1/91
143	No	1.15E+08	1.19E+08	3578000	3.111304	9/9/09	9/9/09
144	No	5750000	5500000	-250000	-4.347826	9/26/93	11/20/94
145	No	5500000	4200000	-1300000	-23.63636	7/1/94	11/30/95
146	Unk	6500000	7300000	800000	12.30769	6/30/95	11/6/95
147	Unk	90000000	97700000	7700000	8.555556	1/23/95	4/1/96
148	No	-999	14897000	14897999	-1491291	9/9/09	9/9/09
149	No	32300000	28311000	-3989000	-12.34985	9/12/94	6/30/95
150	No	43985000	31057000	-12928000	-29.39184	1/15/94	10/15/95
151	No	56000000	68000000	12000000	21.42857	2/15/91	4/14/94
152	No	3628000	3730000	102000	2.811466	7/19/95	10/15/95
153	No	3296000	3519000	223000	6.765777	6/22/95	10/15/95
154	No	38051000	33054000	-4997000	-13.13237	9/1/91	10/1/92
155	No	-999	9752000	9752999	-976276.2	9/9/09	9/9/09
156	No	2437000	3379000	942000	38.65408	2/28/94	10/3/94
157	No	2391000	2704000	313000	13.09076	4/25/94	9/26/94
158	No	4746000	5348000	602000	12.68437	3/1/95	12/5/95
159	No	4734000	5311000	577000	12.18842	9/7/94	9/1/95
160	No	5735000	6425000	690000	12.03139	4/1/95	2/15/96
161	No	11990000	8310000	-3680000	-30.69224	10/3/94	8/4/95
162	No	3805800	3065000	-740800	-19.46503	11/2/92	11/1/93
163	No	14948923	11765367	-3183556	-21.29622	8/1/94	8/1/95
164	No	9078000	7500000	-1578000	-17.38268	6/1/93	8/4/94
165	No	17502500	20821519	3319019	18.96311	12/1/93	9/1/95
166	No	20900000	24300000	3400000	16.26794	11/15/94	1/31/96
167	Yes	1200000	1300000	100000	8.333333	6/8/94	5/2/95
168	No	7832000	8000000	168000	2.145046	5/31/94	6/15/95
169	Yes	-999	-999	0	0	11/21/94	12/24/95

	O	P	Q	R	S	T	U
133	10/3/94	12/12/94	2		25375	2	0
134	6/15/94	3/15/95	46		27975	2	0
135	3/15/95	2/15/96	200		410000	5	0
136	3/15/94	2/15/95	100		86000	1	0
137	1/20/93	10/18/95	0		275818	8	1
138	7/19/93	2/17/95	50	8	62800	0	0
139	4/15/92	3/15/94	50	-9	130000	0	0
140	8/18/92	2/29/96	6	7.5	-999	-999	-999
141	6/22/92	5/30/95	113	7.5	280000	4	3
142	6/15/91	12/15/92	150	3.5	-999	-999	-999
143	2/1/90	12/1/93	-999	8	-999	-999	-999
144	11/15/93	4/14/95	179	7.5	135000	6	1
145	9/1/94	11/30/95	20	6.5	90000	4	0
146	7/5/95	12/15/95	60	8	-999	-999	-999
147	4/17/95	7/1/96	149	5	478774	52	15
148	11/9/92	7/5/95	55	6	126000	0	0
149	9/12/94	7/26/95	72	8.5	112000	0	0
150	11/15/93	1/15/96	-999	7.5	300000	6	4
151	4/16/91	2/1/96	1699	5	-999	-999	-999
152	7/26/95	9/9/09	6	8	40887	2	2
153	7/29/95	11/19/95	6	4	30791	0	0
154	4/9/92	2/5/93	-999	7.5	373661	16	43
155	11/8/93	8/10/95	66	9	132815	2	2
156	2/28/94	12/19/94	40	5	-999	-999	-999
157	4/25/94	10/3/94	15	7.5	-999	-999	-999
158	3/1/95	1/12/96	145	7.5	101000	0	0
159	9/7/94	1/1/96	61	7.5	54190	0	0
160	3/26/95	1/19/96	0	7.5	101044	1	0
161	10/3/94	11/30/95	-999	5	153590	3	1
162	1/1/93	11/20/93	14	-9	51720	0	0
163	8/1/94	8/15/95	30	10	82000	3	0
164	5/24/93	1/31/94	87	10	101357	2	0
165	5/1/94	2/26/96	45	5	245000	2	0
166	10/1/94	5/15/96	-999	5	548000	18	2
167	6/8/94	5/4/95	2	5	87328	0	0
168	5/31/94	10/15/95	200	7.5	160000	8	1
169	11/21/94	9/9/09	6	8.5	-999	-999	-999

	V	W
133	15.76355	0
134	14.29848	0
135	2.439024	0
136	2.325581	0
137	5.800927	0.725116
138	0	0
139	0	0
140	200000	200000
141	2.857143	2.142857
142	200000	200000
143	200000	200000
144	8.888889	1.481481
145	8.888889	0
146	200000	200000
147	21.72215	6.266004
148	0	0
149	0	0
150	4	2.666667
151	200000	200000
152	9.783061	9.783061
153	0	0
154	8.563912	23.01551
155	3.011708	3.011708
156	200000	200000
157	200000	200000
158	0	0
159	0	0
160	1.979336	0
161	3.906504	1.302168
162	0	0
163	7.317073	0
164	3.946447	0
165	1.632653	0
166	6.569343	0.729927
167	0	0
168	10	1.25
169	200000	200000

Appendix C: Database for all Cost Reimbursable Projects

	A	B	C	D	E	F	G
1	cii_id_a	version	resptype	type	char	publpriv	cnsttype
2	C1	Version 1	Contractor	Chemical M	Modernizat	Private	CR
3	C1000	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
4	C104	Version 1	Contractor	Retail Build	Grass Roo	Public	GP
5	C105	Version 1	Contractor	Laboratory	Grass Roo	Private	GP
6	C106	Version 1	Contractor	Rail	Grass Roo	Private	GP
7	C108	Version 1	Contractor	Pulp and P	Grass Roo	Private	CR
8	C109	Version 1	Contractor	Pulp and P	Add-on	Private	CR
9	C11	Version 1	Contractor	Oil Refining	Grass Roo	Private	CR
10	C110	Version 1	Contractor	Chemical M	Modernizat	Private	CR
11	C112	Version 1	Contractor	Lowrise Of	Grass Roo	Private	GP
12	C115	Version 1	Contractor	Lowrise Of	Grass Roo	Private	GP
13	C117	Version 1	Contractor	Housing	Grass Roo	Private	GP
14	C119	Version 1	Contractor	Chemical M	REBUILD (	Private	CR
15	C12	Version 1	Contractor	Pulp and P	Modernizat	Private	CR
16	C121	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
17	C123	Version 1	Contractor	Mining	Grass Roo	Private	CR
18	C124	Version 1	Contractor	Oil Refining	Modernizat	Private	CR
19	C126	Version 1	Contractor	Pharmaceu	Modernizat	Private	CR
20	C127	Version 2	Contractor	Pulp and P	Modernizat	Private	GP
21	C129	Version 2	Contractor	Consumer	Modernizat	Private	GP
22	C13	Version 1	Contractor	Pulp and P	Add-on	Private	CR
23	C131	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
24	C138	Version 2	Contractor	Oil Refining	Modernizat	Private	CR
25	C139	Version 2	Contractor	Consumer	Add-on	Private	CR
26	C145	Version 2	Contractor	Foods	Add-on	Private	CR
27	C150	Version 2	Contractor	Pulp and P	Modernizat	Private	CR
28	C153	Version 2	Contractor	Pulp and P	Add-on	Private	GP
29	C155	Version 2	Contractor	Pulp and P	Grass Roo	Private	CR
30	C157	Version 2	Contractor	Chemical M	Add-on	Private	CR
31	C159	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
32	C160	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
33	C163	Version 2	Contractor	Chemical M	Add-on	Private	CR
34	C164	Version 2	Contractor	Chemical M	Add-on	Private	CR
35	C166	Version 2	Contractor	Chemical M	Add-on	Private	CR
36	C169	Version 2	Contractor	Chemical M	Add-on	Private	CR
37	C174	Version 2	Contractor	Pulp and P	Add-on	Private	GP
38	C175	Version 2	Contractor	Pulp and P	Modernizat	Private	CR
39	C181	Version 2	Contractor	Oil Refining	Modernizat	Private	CR
40	C182	Version 2	Contractor	Chemical M	Add-on	Private	CR
41	C186	Version 2	Contractor	Electrical (	Modernizat	Private	CR
42	C187	Version 2	Contractor	Chemical M	Add-on	Private	CR
43	C188	Version 2	Contractor	Foods	Grass Roo	Private	CR
44	C191	Version 2	Contractor	Oil Refining	Grass Roo	Private	CR

	H	I	J	K	L	M	N
1	desncnst	budcscon	actcscon	concstgro	%cncsgro	plncon_s	plncon_f
2	Constructic	33949259	68842798	34893539	102.7814	1/1/95	9/30/95
3	Design anc	56750000	52750000	-4000000	-7.048458	8/15/93	1/6/95
4	Constructic	4491000	51428000	46937000	1045.135	4/5/93	5/1/95
5	Design anc	40319000	44559000	4240000	10.51613	5/1/91	12/31/92
6	Constructic	1.34E+08	1.47E+08	12907000	9.638563	4/1/93	9/1/95
7	Design anc	69100000	76175000	7075000	10.23878	12/1/94	5/1/96
8	Constructic	26561000	34991000	8430000	31.73826	10/4/93	8/23/94
9	Constructic	1.1E+08	1.36E+08	26573000	24.22665	4/1/91	7/1/93
10	Constructic	20296400	29745200	9448800	46.55407	7/18/94	11/30/95
11	Constructic	43575000	44500000	925000	2.122777	5/1/94	9/30/95
12	Design anc	4636000	4326000	-310000	-6.686799	9/1/93	7/6/94
13	Design anc	13362000	13998000	636000	4.759767	11/16/92	3/11/94
14	Design anc	3000000	16000000	13000000	433.3333	6/7/94	10/31/94
15	Constructic	7321000	11673000	4352000	59.44543	9/9/09	9/9/09
16	Design anc	10359000	11091000	732000	7.066319	7/31/93	3/31/94
17	Design anc	15300000	19400000	4100000	26.79739	5/15/94	7/1/95
18	Design anc	1.37E+08	1.86E+08	49298000	36.02918	5/1/94	11/18/95
19	Design anc	8680800	10832100	2151300	24.78228	2/15/95	10/15/95
20	Design anc	16386000	15721000	-665000	-4.058342	10/3/94	6/27/96
21	Design anc	27000000	33900000	6900000	25.55556	10/1/95	10/21/96
22	Constructic	5454000	14400000	8946000	164.0264	3/12/90	9/21/90
23	Design anc	60606000	79654000	19048000	31.42923	10/15/89	8/15/91
24	Design anc	5924000	8257000	2333000	39.38217	9/15/95	5/15/96
25	Design anc	1306760	1305000	-1760	-0.134684	5/18/96	12/19/96
26	Design anc	25117000	29532000	4415000	17.57774	5/1/95	2/28/96
27	Constructic	8546000	8166000	-380000	-4.446525	2/20/96	5/30/97
28	Design anc	24415000	21455000	-2960000	-12.12369	6/7/95	4/1/96
29	Design anc	6786000	5895000	-891000	-13.12997	6/5/96	4/19/97
30	Design anc	11455000	12471000	1016000	8.869489	10/20/95	10/30/96
31	Design anc	9215000	10890000	1675000	18.17689	11/1/95	12/31/96
32	Design anc	6942000	5895000	-1047000	-15.08211	9/1/95	9/5/96
33	Design anc	-888	-888	0	0	5/2/95	12/31/96
34	Design Onl	-777	-777	0	0	7/7/07	7/7/07
35	Constructic	17838684	21387700	3549016	19.89506	11/13/95	9/13/96
36	Design anc	31389000	30916000	-473000	-1.506897	7/1/93	12/5/94
37	Constructic	6000000	6841000	841000	14.01667	6/24/95	5/3/96
38	Constructic	5086000	5947000	861000	16.92882	6/1/95	7/1/96
39	Constructic	704833	553454	-151379	-21.47729	1/22/96	7/26/96
40	Constructic	455395	647500	192105	42.18426	5/1/96	9/15/96
41	Constructic	15523890	26972234	11448344	73.74662	9/9/96	12/13/96
42	Design anc	29000000	32000000	3000000	10.34483	10/1/95	12/1/96
43	Design anc	34029975	33468219	-561756	-1.650768	7/15/94	9/15/95
44	Design anc	96668000	70276000	-26392000	-27.30169	11/1/94	5/2/96

	O	P	Q	R	S	T	U
1	actcon_s	actcon_f	nochgcon	complexity	crfwkhrs	rics	lwcs
2	1/1/95	9/9/09	101		2333896	6	0
3	7/9/93	7/7/07	126		750000	11	4
4	4/5/93	9/9/09	27		-999	-999	-999
5	5/1/91	9/9/09	240		471000	38	12
6	6/23/93	9/9/09	1400		1799684	149	37
7	11/11/94	9/9/09	9		1191000	43	0
8	10/4/93	9/9/09	1000		1357001	-971	-999
9	4/1/91	9/9/09	4		1815723	-900	-984
10	8/1/94	9/9/09	6		1022956	11	2
11	5/10/94	9/3/95	220		540000	17	8
12	11/12/93	7/6/94	6		11001	-996	-999
13	11/16/92	3/28/94	104		64991	-985	-997
14	6/7/94	10/31/94	15		113085	-990	-998
15	3/12/90	9/1/93	28		130540	-992	-998
16	9/30/93	8/31/94	47		130000	2	0
17	10/15/94	10/20/95	900		529001	-968	-994
18	4/1/94	12/18/95	6		3253256	22	2
19	3/15/95	7/15/96	-999		90000	0	0
20	11/14/94	7/7/07	14		447769	22	2
21	10/1/95	7/7/07	1778		587000	21	8
22	3/12/90	12/14/90	302		107438	-994	-997
23	10/15/89	7/7/07	-88		2925415	170	23
24	8/15/95	7/7/07	38		125000	0	0
25	9/30/96	7/7/07	192		23500	0	0
26	5/1/95	7/7/07	-876		416500	5	2
27	2/20/96	2/11/97	255		201722	5	0
28	6/7/95	4/1/96	-1776		425000	14	1
29	6/21/96	3/27/97	205		65000	0	0
30	10/20/95	9/20/96	0		199112	-887	-888
31	11/1/95	1/28/97	-1776		326000	4	0
32	9/1/95	9/25/96	-1776		184000	1	0
33	5/1/95	3/1/96	-1998		1282476	16	0
34	7/7/07	3/29/96	-1554		-1554	-1554	-1554
35	10/16/95	3/31/96	30		375420	8	0
36	7/19/93	4/1/96	-1776		1171000	7	0
37	7/1/95	5/17/96	144		143744	2	0
38	6/1/95	6/1/96	118		221824	4	1
39	2/15/96	9/22/96	8		15656	0	0
40	5/20/96	9/25/96	19		15123	0	0
41	9/14/96	1/13/97	578		972217	18	1
42	10/1/95	11/1/96	56		520200	4	0
43	10/15/94	11/25/96	-451		363000	7	1
44	9/8/94	12/13/96	-1776		639600	5	0

	V	W
1	RIR	LWCIR
2	0.514162	0
3	2.933333	1.066667
4	200000	200000
5	16.13588	5.095541
6	16.55846	4.111833
7	7.220823	0
8	-143.1097	-147.2364
9	-99.13406	-108.3866
10	2.15063	0.391024
11	6.296296	2.962963
12	-18107.44	-18161.99
13	-3031.189	-3068.117
14	-1750.895	-1765.044
15	-1519.841	-1529.033
16	3.076923	0
17	-365.9728	-375.8027
18	1.352491	0.122954
19	0	0
20	9.826495	0.893318
21	7.155026	2.725724
22	-1850.37	-1855.954
23	11.62228	1.572426
24	0	0
25	0	0
26	2.40096	0.960384
27	4.957317	0
28	6.588235	0.470588
29	0	0
30	-890.9558	-891.9603
31	2.453988	0
32	1.086957	0
33	2.495173	0
34	200000	200000
35	4.261893	0
36	1.195559	0
37	2.782725	0
38	3.606463	0.901616
39	0	0
40	0	0
41	3.702877	0.205715
42	1.53787	0
43	3.856749	0.550964
44	1.563477	0

	A	B	C	D	E	F	G
45	C192	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
46	C193	Version 2	Contractor	Chemical M	Grass Roo	Private	CR
47	C195	Version 2	Contractor	Oil Refinin	Grass Roo	Private	CR
48	C200	Version 2	Contractor	Chemical M	Add-on	Private	CR
49	C21	Version 1	Contractor	Natural Ga	Major repa	Private	CR
50	C213	Version 2	Contractor	Oil Refinin	Modernizat	Private	CR
51	C214	Version 2	Contractor	Chemical M	Add-on	Private	CR
52	C217	Version 2	Contractor	Natural Ga	Modernizat	Private	CR
53	C218	Version 2	Contractor	Metals Ref	Add-on	Private	CR
54	C219	Version 2	Contractor	Retail Builc	Grass Roo	Private	GP
55	C220	Version 2	Contractor	Hospital	Grass Roo	Private	GP
56	C24	Version 1	Contractor	Lowrise Of	Grass Roo	Public	CR
57	C25	Version 1	Contractor	Consumer	Modernizat	Private	CR
58	C26	Version 1	Contractor	Chemical M	Add-on	Private	CR
59	C27	Version 1	Contractor	Consumer	Modernizat	Private	CR
60	C31	Version 1	Contractor	Lowrise Of	Grass Roo	Private	CR
61	C32	Version 1	Contractor	Chemical M	Add-on	Private	CR
62	C34	Version 1	Contractor	Pulp and P	Add-on	Private	CR
63	C42	Version 1	Contractor	Oil Refinin	Add-on	Private	CR
64	C51	Version 1	Contractor	Water/Was	Grass Roo	Private	CR
65	C53	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
66	C54	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
67	C55	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
68	C56	Version 1	Contractor	Oil Refinin	Modernizat	Private	CR
69	C57	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
70	C59	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
71	C61	Version 1	Contractor	Oil Refinin	Add-on	Private	CR
72	C62	Version 1	Contractor	Chemical M	Grass Roo	Private	CR
73	C63	Version 1	Contractor	Oil Refinin	Grass Roo	Private	CR
74	C64	Version 1	Contractor	Oil Refinin	Grass Roo	Private	CR
75	C65	Version 1	Contractor	Oil Refinin	Grass Roo	Private	CR
76	C67	Version 1	Contractor	Environme	Add-on	Private	CR
77	C71	Version 1	Contractor	Pharmaceu	Modernizat	Private	CR
78	C74	Version 1	Contractor	Oil Refinin	Add-on	Private	CR
79	C75	Version 1	Contractor	Oil Refinin	Grass Roo	Private	CR
80	C80	Version 1	Contractor	Oil Refinin	Add-on	Private	CR
81	C86	Version 1	Contractor	Environme	Grass Roo	Private	CR
82	C88	Version 1	Contractor	Pulp and P	Add-on	Private	CR
83	C90	Version 1	Contractor	Retail Builc	Add-on	Private	GP
84	C93	Version 1	Contractor	Laboratory	Modernizat	Public	CR
85	C95	Version 1	Contractor	Chemical M	Add-on	Private	CR
86	C96	Version 1	Contractor	Pulp and P	Modernizat	Private	CR
87	C97	Version 1	Contractor	Chemical M	Add-on	Private	CR
88	C99	Version 1	Contractor	Chemical M	Grass Roo	Private	CR

	H	I	J	K	L	M	N
45	Design anc	27079000	25100000	-1979000	-7.308246	3/15/95	6/1/96
46	Design anc	1.01E+08	1.05E+08	3600000	3.564356	7/1/95	5/1/97
47	Design anc	22537000	24871000	2334000	10.3563	1/9/95	6/7/96
48	Design anc	27149000	35621000	8472000	31.20557	11/30/95	12/31/96
49	Constructic	23974000	26093000	2119000	8.838742	10/21/94	3/10/95
50	Design anc	950000	853000	-97000	-10.21053	10/15/94	8/15/96
51	Design anc	53227000	55320000	2093000	3.932215	1/1/96	5/15/97
52	Design anc	2.83E+08	3.42E+08	59752000	21.1501	8/1/92	4/1/95
53	Constructic	9766000	11394000	1628000	16.67008	5/1/96	6/30/97
54	Constructic	28000000	32500000	4500000	16.07143	8/1/95	10/15/96
55	Design anc	4416000	4429000	13000	0.294384	8/6/96	7/3/97
56	Constructic	14748000	17809000	3061000	20.75536	1/1/94	3/15/95
57	Constructic	4850000	4750000	-100000	-2.061856	8/1/93	11/1/94
58	Constructic	2600000	4500000	1900000	73.07692	12/1/93	7/1/94
59	Constructic	5985000	6327000	342000	5.714286	10/1/93	3/1/95
60	Constructic	16500000	27300000	10800000	65.45455	5/14/95	8/1/95
61	Design anc	-999	-999	0	0	3/15/95	4/15/96
62	Constructic	16276000	15258000	-1018000	-6.254608	2/1/92	7/1/93
63	Design anc	56100000	38100000	-18000000	-32.08556	4/15/93	9/1/94
64	Constructic	32046000	32046000	0	0	10/1/92	12/15/93
65	Design anc	37025000	40543000	3518000	9.501688	6/1/93	1/30/95
66	Design anc	-999	-999	0	0	7/30/94	11/1/95
67	Design anc	1000000	1475000	475000	47.5	5/1/94	8/11/95
68	Design anc	9675000	8223000	-1452000	-15.00775	1/16/95	2/20/95
69	Design anc	23824000	29289000	5465000	22.93905	2/20/95	4/30/96
70	Design anc	48148000	60964000	12816000	26.61793	4/1/91	6/30/92
71	Design anc	43961000	44745000	784000	1.783399	9/13/91	5/14/93
72	Design anc	97938000	64086400	-33851600	-34.56432	3/10/93	7/14/95
73	Design anc	36146000	33378000	-2768000	-7.657832	6/1/93	4/29/94
74	Design anc	57000000	50568000	-6432000	-11.28421	11/1/93	5/1/95
75	Design anc	22537000	24871000	2334000	10.3563	1/9/95	6/7/96
76	Design anc	14368000	14725000	357000	2.484688	6/1/95	3/30/96
77	Design anc	3290000	2612000	-678000	-20.6079	1/4/94	7/15/94
78	Design anc	95234000	96193000	959000	1.006993	6/1/95	12/8/96
79	Design anc	13299000	12267000	-1032000	-7.759982	1/23/95	11/1/95
80	Design anc	-999	-999	0	0	4/15/93	6/1/95
81	Design anc	225000	357000	132000	58.66667	11/10/93	4/1/94
82	Constructic	961252	1240000	278748	28.99843	4/1/95	7/31/95
83	Design anc	22600000	22182249	-417751	-1.848456	10/1/93	8/1/95
84	Design anc	2.61E+08	2.46E+08	-14914000	-5.714943	8/15/90	3/31/93
85	Design anc	45375000	64600000	19225000	42.36915	10/1/94	8/30/95
86	Design Onl	85000	53000	-32000	-37.64706	7/15/95	4/15/96
87	Design anc	30792000	40936000	10144000	32.94362	9/9/09	7/31/95
88	Design anc	21800000	26500000	4700000	21.55963	3/15/95	1/1/97

	O	P	Q	R	S	T	U
45	3/7/95	12/16/96	-1776		442800	2	0
46	8/15/95	12/31/96	53		1745500	17	1
47	12/27/94	1/6/97	52		475559	0	0
48	11/30/95	1/25/97	-1776		522001	-992	-998
49	10/21/94	4/3/95	268		946501	12	0
50	10/15/94	4/30/97	1		-888	-888	-888
51	1/1/96	5/12/97	123		1780000	3	0
52	4/17/93	7/8/97	111	6	13622992	58	6
53	5/1/96	7/18/97	98	7.5	153308	5	0
54	8/1/95	8/15/97	150	7	960000	-888	-888
55	8/6/96	11/2/97	21	5	27000	0	0
56	1/10/94	7/6/94	10	7.5	60548	-995	-998
57	8/1/93	7/15/94	296	7.5	245340	5	0
58	12/1/93	8/1/94	195	7	524615	8	1
59	10/1/93	8/15/94	260	8	146284	2	1
60	5/14/95	9/9/09	3	5.5	46500	3	3
61	3/1/95	6/30/96	0	9	75923	1	0
62	2/1/92	11/1/94	-999	2.5	890316	44	9
63	5/1/93	1/1/95	30	6	483000	4	1
64	10/1/92	4/17/95	30	7.5	1078365	20	0
65	5/15/93	5/1/95	185	6.5	712000	4	0
66	7/30/94	5/24/95	310	6.5	412546	4	0
67	5/23/94	5/31/95	-999	7.5	250000	12	3
68	1/23/95	3/8/95	245	8.5	105790	5	0
69	2/20/95	9/9/09	-999	8	772138	4	1
70	5/6/91	8/14/92	199	5	2349000	23	3
71	9/13/91	8/30/95	-999	6.5	1014000	10	0
72	5/14/93	8/30/95	10	5	1016400	9	0
73	6/1/93	9/1/95	-999	6	554000	3	0
74	11/1/93	9/3/95	-999	5	2280000	22	0
75	12/27/94	9/15/95	52	7.5	475559	0	0
76	3/28/95	9/29/95	137	1	186530	2	0
77	1/24/94	7/15/94	-999	5	45362	0	0
78	6/1/95	11/30/96	121	7.5	1452000	16	1
79	1/31/95	12/1/95	25	7.5	234589	0	0
80	5/1/93	1/18/96	220	7	-999	-999	-999
81	10/1/93	4/1/94	4	5	40021	0	0
82	4/1/95	11/22/95	1	6	35354	2	0
83	10/1/93	4/3/96	12	6.5	180000	-999	-999
84	8/15/90	4/27/96	320	5	2279778	17	1
85	10/1/94	6/15/96	128	5	1499000	20	0
86	6/15/95	6/30/96	0	5.5	-1998	-1998	-1998
87	4/1/94	7/15/96	-999	5	379344	5	2
88	9/15/94	11/30/96	50	8	436850	48	8

	V	W
45	0.903342	0
46	1.947866	0.11458
47	0	0
48	-380.0759	-382.3747
49	2.535655	0
50	200000	200000
51	0.337079	0
52	0.851502	0.088086
53	6.522817	0
54	-185	-185
55	0	0
56	-3286.649	-3296.558
57	4.075976	0
58	3.049856	0.381232
59	2.734407	1.367204
60	12.90323	12.90323
61	2.634248	0
62	9.884131	2.021754
63	1.656315	0.414079
64	3.709319	0
65	1.123596	0
66	1.939178	0
67	9.6	2.4
68	9.452689	0
69	1.036084	0.259021
70	1.95828	0.255428
71	1.972387	0
72	1.770956	0
73	1.083032	0
74	1.929825	0
75	0	0
76	2.144427	0
77	0	0
78	2.203857	0.137741
79	0	0
80	200000	200000
81	0	0
82	11.31414	0
83	-1110	-1110
84	1.491373	0.087728
85	2.668446	0
86	200000	200000
87	2.63613	1.054452
88	21.97551	3.662584

	A	B	C	D	E	F	G
89	O100	Version 1	Owner	Microelectr	Add-on	Private	CR
90	O1000	Version 2	Owner	Oil Refinin(	Modernizat	Private	CR
91	O101	Version 1	Owner	Highrise O	Grass Roo	Private	CR
92	O102	Version 1	Owner	Microelectr	Add-on	Private	CR
93	O104	Version 2	Owner	Laboratory	Grass Roo	Private	GP
94	O105	Version 2	Owner	Oil Refinin(	Modernizat	Private	CR
95	O106	Version 2	Owner	Marine Fac	Add-on	Private	CR
96	O107	Version 2	Owner	Oil Refinin(	Modernizat	Private	CR
97	O108	Version 2	Owner	Environme	Grass Roo	Private	CR
98	O109	Version 2	Owner	Oil Refinin(	Add-on	Private	CR
99	O110	Version 2	Owner	Metals Ref	Grass Roo	Private	CR
100	O111	Version 2	Owner	Metals Ref	Modernizat	Private	CR
101	O113	Version 2	Owner	Metals Ref	Modernizat	Private	CR
102	O115	Version 2	Owner	Chemical M	Grass Roo	Private	CR
103	O117	Version 2	Owner	Chemical M	Modernizat	Private	CR
104	O12	Version 1	Owner	Chemical M	Add-on	Private	CR
105	O122	Version 2	Owner	Pharmaceu	Modernizat	Private	GP
106	O123	Version 2	Owner	Pharmaceu	Modernizat	Private	GP
107	O125	Version 2	Owner	Pharmaceu	Modernizat	Private	CR
108	O127	Version 2	Owner	Chemical M	Add-on	Private	CR
109	O129	Version 2	Owner	Electrical (	Add-on	Public	CR
110	O13	Version 1	Owner	Chemical M	Modernizat	Private	CR
111	O130	Version 2	Owner	Electrical (	Add-on	Public	CR
112	O132	Version 2	Owner	Electrical (	Modernizat	Public	CR
113	O133	Version 2	Owner	Metals Ref	Grass Roo	Private	CR
114	O14	Version 1	Owner	Chemical M	Add-on	Private	CR
115	O141	Version 2	Owner	Metals Ref	Add-on	Private	GP
116	O143	Version 2	Owner	Chemical M	Grass Roo	Private	CR
117	O146	Version 2	Owner	Oil Refinin(	Add-on	Private	CR
118	O147	Version 2	Owner	Oil Refinin(	Add-on	Private	CR
119	O148	Version 2	Owner	Oil Refinin(	Add-on	Private	CR
120	O15	Version 1	Owner	Chemical M	Modernizat	Private	CR
121	O150	Version 2	Owner	Pulp and P	Add-on	Private	CR
122	O151	Version 2	Owner	Pulp and P	Modernizat	Private	CR
123	O156	Version 2	Owner	Water/Was	Modernizat	Private	CR
124	O157	Version 2	Owner	Foods	Modernizat	Private	GP
125	O16	Version 1	Owner	Chemical M	Grass Roo	Private	CR
126	O160	Version 2	Owner	Consumer	Add-on	Private	CR
127	O161	Version 2	Owner	Foods	Add-on	Private	CR
128	O162	Version 2	Owner	Consumer	Modernizat	Private	CR
129	O163	Version 2	Owner	Consumer	Add-on	Private	CR
130	O164	Version 2	Owner	Chemical M	Modernizat	Private	CR
131	O167	Version 2	Owner	Pharmaceu	Grass Roo	Private	CR
132	O168	Version 2	Owner	Chemical M	Grass Roo	Private	CR

	H	I	J	K	L	M	N
89	No	-999	-999	0	0	9/9/09	9/9/09
90	No	11250000	16000000	4750000	42.22222	9/1/94	12/1/95
91	Yes	-999	-999	0	0	9/9/09	9/9/09
92	Yes	-999	-999	0	0	9/9/09	9/9/09
93	Yes	8493000	8069000	-424000	-4.992347	5/15/95	7/30/96
94	No	26049000	20489000	-5560000	-21.34439	2/10/96	7/23/96
95	Yes	5125000	4846000	-279000	-5.443902	9/15/95	8/6/96
96	No	18630000	20289000	1659000	8.904992	10/1/95	4/17/96
97	Yes	94491000	94154000	-337000	-0.356648	11/1/93	3/1/94
98	Yes	3540000	3100000	-440000	-12.42938	6/29/96	12/19/96
99	Yes	6391937	7360572	968635	15.15401	3/15/95	3/15/96
100	No	28640000	29229000	589000	2.056564	3/3/95	3/31/97
101	No	14926000	22000000	7074000	47.39381	12/1/92	2/1/94
102	No	37500000	30100000	-7400000	-19.73333	2/1/96	3/1/97
103	No	9900000	8150000	-1750000	-17.67677	11/15/95	8/15/96
104	Yes	-999	5965000	5965999	-597197.1	9/9/09	9/9/09
105	No	2600000	3100000	500000	19.23077	3/8/96	9/19/96
106	No	5575000	5210000	-365000	-6.547085	4/15/96	10/15/96
107	No	46400000	47400000	1000000	2.155172	12/1/94	7/1/96
108	No	7435000	7854000	419000	5.635508	4/1/95	4/1/96
109	No	36354000	46975000	10621000	29.21549	5/23/94	9/30/95
110	No	12040000	10020000	-2020000	-16.77741	1/15/95	7/15/95
111	Yes	2301000	2413000	112000	4.867449	10/7/94	9/30/96
112	No	2941000	2740000	-201000	-6.83441	2/10/96	3/23/96
113	Unk	16792000	18546000	1754000	10.44545	10/1/95	5/1/96
114	No	32450000	40600000	8150000	25.11556	3/1/93	2/18/94
115	No	-888	-888	0	0	5/17/96	10/25/96
116	No	22200000	17900000	-4300000	-19.36937	5/1/95	4/1/96
117	Yes	-888	-888	0	0	11/1/93	10/31/95
118	Yes	88854000	98570000	9716000	10.93479	2/10/93	6/1/94
119	Yes	27600000	22400000	-5200000	-18.84058	3/1/95	8/1/96
120	No	60000000	62800000	2800000	4.666667	2/1/94	1/15/95
121	No	2126000	4505000	2379000	111.9003	3/22/96	10/7/96
122	No	3200000	3549000	349000	10.90625	8/8/08	8/8/08
123	No	16137000	-888	-16137888	-100.0055	3/1/94	6/1/96
124	No	8536900	8320000	-216900	-2.540735	10/28/96	4/18/97
125	Yes	1.85E+08	1.77E+08	-8000000	-4.324324	5/1/92	5/1/94
126	No	2057000	1831000	-226000	-10.98687	3/15/96	10/15/96
127	Yes	30900000	34600000	3700000	11.97411	11/1/95	1/1/97
128	No	-888	-888	0	0	10/7/96	4/11/97
129	No	727000	592000	-135000	-18.56946	4/1/96	6/17/96
130	Yes	3998000	4930000	932000	23.31166	5/3/96	12/13/96
131	Yes	11895000	11805000	-90000	-0.75662	1/15/94	1/6/95
132	No	8100000	5936000	-2164000	-26.71605	5/1/95	12/1/95

	O	P	Q	R	S	T	U
89	9/9/09	9/9/09	-999	5	27630	0	0
90	10/1/94	11/15/95	24	2.5	82000	5	2
91	9/9/09	9/9/09	-999	3	145836	11	2
92	9/9/09	9/9/09	-999	8	1152930	31	0
93	5/1/95	7/30/96	37	5.5	102100	1	0
94	2/10/96	9/1/96	3	8	276710	3	0
95	9/15/95	1/31/97	0	7.5	51000	1	0
96	10/1/95	4/17/96	-1776	7	318000	1	0
97	11/1/93	4/1/94	-1776		1850000	12	3
98	6/19/96	1/23/97	0		43000	0	0
99	11/15/94	8/11/95	4		133292	7	1
100	3/13/95	9/23/96	86		579190	32	2
101	9/1/93	5/1/94	-1776		-888	-888	-888
102	1/15/96	2/15/97	2		550000	4	0
103	12/15/95	8/15/96	0		196000	0	0
104	8/1/94	6/1/95	-999		63165	1	0
105	3/15/96	8/31/96	59		47000	1	0
106	4/15/96	9/15/96	5		120000	1	0
107	12/1/94	9/1/96	-1776		900000	34	4
108	2/1/95	1/1/96	10		100000	0	0
109	9/23/94	12/14/95	-1776		542260	8	1
110	1/15/95	8/30/95	-999		63000	6	0
111	10/7/94	11/24/95	-1776		29560	1	1
112	2/10/96	3/23/96	49		49108	2	0
113	11/1/95	7/1/96	8		297437	3	3
114	3/1/93	6/1/94	-999		-999	-999	-999
115	4/29/96	11/15/96	5		-888	-888	-888
116	3/15/95	4/1/96	0		500000	2	0
117	11/1/93	8/14/95	117		2783000	14	0
118	3/15/93	6/1/94	25		870000	12	2
119	3/1/95	7/13/96	-1776		336000	0	0
120	3/15/94	5/1/95	-999		-999	-999	-999
121	5/1/96	4/18/97	0		73123	0	0
122	5/6/96	2/27/97	0		80713	0	0
123	2/1/94	1/1/96	-1776		38830	0	0
124	10/28/96	4/18/97	8		76000	0	0
125	6/15/92	5/19/94	-999		1120000	-999	-999
126	3/15/96	10/15/96	-1776		34980	0	0
127	11/1/95	1/1/97	26		621000	10	0
128	10/7/96	4/11/97	0		38000	0	0
129	4/15/96	7/22/96	0		-888	0	0
130	3/18/96	4/11/97	106		133366	0	0
131	1/15/94	12/7/94	80		-888	-888	-888
132	5/15/95	11/16/95	-1776		96000	2	0

	V	W
89	0	0
90	12.19512	4.878049
91	15.08544	2.742807
92	5.377603	0
93	1.958864	0
94	2.168335	0
95	3.921569	0
96	0.628931	0
97	1.297297	0.324324
98	0	0
99	10.50326	1.500465
100	11.04991	0.69062
101	200000	200000
102	1.454545	0
103	0	0
104	3.16631	0
105	4.255319	0
106	1.666667	0
107	7.555556	0.888889
108	0	0
109	2.950614	0.368827
110	19.04762	0
111	6.7659	6.7659
112	8.145312	0
113	2.017234	2.017234
114	200000	200000
115	200000	200000
116	0.8	0
117	1.006109	0
118	2.758621	0.45977
119	0	0
120	200000	200000
121	0	0
122	0	0
123	0	0
124	0	0
125	-178.3929	-178.3929
126	0	0
127	3.220612	0
128	0	0
129	0	0
130	0	0
131	200000	200000
132	4.166667	0

	A	B	C	D	E	F	G
133	O169	Version 2	Owner	Chemical M	Grass Roo	Private	CR
134	O172	Version 2	Owner	Oil Refinin	Modernizat	Private	CR
135	O173	Version 2	Owner	Oil Refinin	Add-on	Private	CR
136	O175	Version 2	Owner	Water/Was	Grass Roo	Private	CR
137	O176	Version 2	Owner	Chemical M	Add-on	Private	CR
138	O179	Version 2	Owner	Water/Was	Grass Roo	Private	CR
139	O188	Version 2	Owner	Chemical M	Add-on	Private	CR
140	O189	Version 2	Owner	Oil Refinin	Add-on	Private	CR
141	O196	Version 2	Owner	Chemical M	Add-on	Private	CR
142	O22	Version 1	Owner	Chemical M	Grass Roo	Private	CR
143	O25	Version 1	Owner	Chemical M	Add-on	Private	CR
144	O26	Version 1	Owner	Laboratory	Grass Roo	Private	GP
145	O28	Version 1	Owner	Pulp and P	Grass Roo	Private	CR
146	O38	Version 1	Owner	Lowrise Of	Modernizat	Private	GP
147	O42	Version 1	Owner	Lowrise Of	Grass Roo	Private	CR
148	O43	Version 1	Owner	Lowrise Of	Add-on	Private	CR
149	O52	Version 1	Owner	Environme	Grass Roo	Private	GP
150	O54	Version 1	Owner	Chemical M	Add-on	Private	CR
151	O62	Version 1	Owner	Consumer	Grass Roo	Private	GP
152	O63	Version 1	Owner	Consumer	Add-on	Private	CR
153	O64	Version 1	Owner	Consumer	Modernizat	Private	CR
154	O65	Version 1	Owner	Warehouse	Modernizat	Private	CR
155	O66	Version 1	Owner	Consumer	Add-on	Private	CR
156	O69	Version 1	Owner	Oil Refinin	Add-on	Private	CR
157	O70	Version 1	Owner	Chemical M	Grass Roo	Private	GP
158	O71	Version 1	Owner	Oil Refinin	Modernizat	Private	CR
159	O72	Version 1	Owner	Oil Refinin	Add-on	Private	CR
160	O73	Version 1	Owner	Oil Refinin	Grass Roo	Private	CR
161	O74	Version 1	Owner	Oil Refinin	Modernizat	Private	CR
162	O75	Version 1	Owner	Oil Refinin	Grass Roo	Private	CR
163	O76	Version 1	Owner	Oil Refinin	Grass Roo	Private	CR
164	O77	Version 1	Owner	Chemical M	Grass Roo	Private	CR
165	O79	Version 1	Owner	Pulp and P	Modernizat	Private	CR
166	O81	Version 1	Owner	Pulp and P	Add-on	Private	CR
167	O82	Version 1	Owner	Chemical M	Add-on	Private	CR
168	O83	Version 1	Owner	Laboratory	Grass Roo	Private	CR
169	O84	Version 1	Owner	Laboratory	Grass Roo	Private	CR
170	O85	Version 1	Owner	Lowrise Of	Grass Roo	Private	CR
171	O86	Version 1	Owner	Electrical (	Modernizat	Public	CR
172	O88	Version 1	Owner	Electrical (	Modernizat	Public	CR
173	O89	Version 1	Owner	Electrical (	Modernizat	Public	CR
174	O90	Version 1	Owner	Electrical (	Modernizat	Public	CR
175	O91	Version 1	Owner	Oil Refinin	Add-on	Private	CR
176	O92	Version 1	Owner	Chemical M	Add-on	Private	CR

	H	I	J	K	L	M	N
133	No	70388000	54497000	-15891000	-22.57629	9/1/94	11/1/95
134	No	-888	-888	0	0	1/1/96	5/1/96
135	No	13524000	15300000	1776000	13.13221	3/1/96	12/1/96
136	No	2192000	2037000	-155000	-7.071168	4/19/95	12/5/95
137	No	13784320	13832000	47680	0.3459	6/15/94	11/15/95
138	No	13547000	10755000	-2792000	-20.60973	2/5/95	2/5/96
139	No	12112000	14778000	2666000	22.01123	10/24/95	7/24/96
140	No	2000000	3325000	1325000	66.25	3/1/94	4/1/94
141	Yes	-888	-888	0	0	8/8/08	8/8/08
142	No	62100000	55100000	-7000000	-11.27214	4/15/94	4/15/95
143	No	9457000	6089000	-3368000	-35.61383	12/15/92	11/15/93
144	No	20130000	19485000	-645000	-3.204173	7/15/93	4/15/95
145	No	26200000	35683000	9483000	36.19466	7/15/90	11/26/91
146	No	1.28E+08	1.32E+08	4000000	3.125	4/9/93	12/28/95
147	No	28190000	25474000	-2716000	-9.634622	9/9/09	9/9/09
148	No	33120000	34700000	1580000	4.770531	7/23/93	4/30/96
149	Yes	-999	-999	0	0	6/1/91	10/30/92
150	No	4685000	6962000	2277000	48.60192	5/1/95	11/15/95
151	No	53617000	54055000	438000	0.816905	8/15/93	1/1/95
152	No	6025000	4415000	-1610000	-26.72199	11/1/94	8/31/95
153	No	7852000	7144000	-708000	-9.016811	3/1/94	6/15/95
154	No	12000000	12000000	0	0	8/1/94	2/1/96
155	Yes	18500000	17840000	-660000	-3.567568	3/6/95	11/20/95
156	No	16725000	8000000	-8725000	-52.16741	2/13/95	12/29/95
157	No	2.23E+08	2.06E+08	-17250000	-7.74237	8/15/92	3/15/94
158	No	19403000	21892000	2489000	12.82791	3/1/95	10/20/95
159	No	18100000	18700000	600000	3.314917	5/1/93	10/1/94
160	No	33100000	24300000	-8800000	-26.5861	8/1/94	10/31/95
161	No	3800000	3500000	-300000	-7.894737	7/1/94	5/1/95
162	No	90600000	80800000	-9800000	-10.81678	5/1/93	6/1/95
163	No	35400000	25800000	-9600000	-27.11864	5/1/93	6/1/95
164	No	58500000	45100000	-13400000	-22.90598	5/1/93	4/1/95
165	No	6989000	7326000	337000	4.821863	2/1/95	6/30/95
166	No	3683000	4725000	1042000	28.29215	9/9/09	9/9/09
167	Yes	29000000	30000000	1000000	3.448276	2/15/94	10/15/95
168	No	14500000	12935000	-1565000	-10.7931	8/1/93	3/30/95
169	No	38485000	37965000	-520000	-1.351176	8/15/91	6/30/93
170	No	1.44E+08	1.38E+08	-5900000	-4.097222	1/1/90	12/31/94
171	Yes	6112000	7121000	1009000	16.50851	10/10/95	1/19/96
172	No	2869000	3180000	311000	10.84001	4/22/95	6/6/95
173	No	1685000	1864000	179000	10.62315	5/7/94	7/1/94
174	Yes	40964000	37300000	-3664000	-8.944439	10/1/93	5/30/96
175	No	3278000	2818000	-460000	-14.03295	10/1/95	4/29/96
176	No	1731400	3551000	1819600	105.0941	5/3/93	7/1/94

	O	P	Q	R	S	T	U
133	8/30/94	10/31/95	8		617300	13	0
134	1/1/96	6/30/96	0		-999	-999	-999
135	3/1/96	12/15/96	-1776		-888	-888	-888
136	4/10/95	6/28/96	8		81415	2	0
137	6/15/94	11/15/95	2		581000	8	0
138	3/13/95	4/18/96	-1776		148360	5	1
139	12/6/95	10/26/96	-1776		660000	4	0
140	10/1/94	11/1/94	-1776		45000	0	0
141	8/8/08	8/8/08	-1776		317725	-888	0
142	3/15/94	6/15/95	0		1117000	21	1
143	2/15/93	9/15/93	0		120000	1	0
144	7/15/93	1/15/95	190		186000	6	1
145	8/13/90	4/13/92	0		637000	38	9
146	10/2/93	4/1/96	-999		1000000	8	-999
147	7/22/93	9/7/95	40		391409	4	0
148	7/23/93	4/22/96	51		496000	14	0
149	11/1/90	4/1/93	5	7	216113	4	1
150	5/1/95	11/27/95	16	6	69451	2	0
151	8/15/93	2/1/95	45	8	468508	9	1
152	11/1/94	9/7/95	11	9	106400	0	0
153	3/1/94	6/1/95	416	1	155862	1	1
154	8/1/94	6/1/96	4	7.5	205000	1	0
155	4/3/95	2/12/96	50	7.5	404593	1	0
156	7/5/95	12/15/95	327	8	111398	2	0
157	10/15/92	7/15/94	320	8.5	5000000	98	3
158	3/1/95	11/14/95	640	9	541269	-999	-999
159	5/1/93	10/1/94	-999	5	240000	4	0
160	6/1/94	10/1/95	-999	5	298000	5	1
161	4/1/94	6/1/95	-999	3.5	67560	1	0
162	5/3/93	4/17/95	-999	8	2784268	32	1
163	5/1/93	3/24/95	-999	7.5	1093820	13	1
164	6/1/93	2/27/95	-999	8	914000	8	0
165	3/1/95	9/30/95	0	6.5	320000	6	0
166	2/1/95	7/15/95	-999	2.5	148414	10	1
167	4/15/94	7/15/95	1200	9	367532	5	2
168	8/1/93	2/28/95	0	2.5	128000	0	0
169	8/15/91	12/30/93	1	8.5	300000	16	4
170	1/1/90	10/31/94	1500	8	1067000	22	9
171	10/10/95	1/17/96	136	8.5	84680	2	0
172	4/22/95	6/6/95	28	5	64200	1	0
173	5/7/94	7/1/94	8	5	61168	0	0
174	2/1/94	6/30/96	-999	6.5	604900	8	0
175	10/1/95	4/29/96	24	7.5	60000	1	1
176	5/3/93	7/11/94	170	10	159968	3	0

	V	W
133	4.21189	0
134	200000	200000
135	200000	200000
136	4.9131	0
137	2.753873	0
138	6.740361	1.348072
139	1.212121	0
140	0	0
141	-558.974	0
142	3.760072	0.179051
143	1.666667	0
144	6.451613	1.075269
145	11.93093	2.825746
146	1.6	-199.8
147	2.043898	0
148	5.645161	0
149	3.701767	0.925442
150	5.759456	0
151	3.841983	0.426887
152	0	0
153	1.283186	1.283186
154	0.97561	0
155	0.494324	0
156	3.590729	0
157	3.92	0.12
158	-369.1325	-369.1325
159	3.333333	0
160	3.355705	0.671141
161	2.960332	0
162	2.298629	0.071832
163	2.376991	0.182845
164	1.750547	0
165	3.75	0
166	13.47582	1.347582
167	2.720852	1.088341
168	0	0
169	10.66667	2.666667
170	4.123711	1.686973
171	4.723666	0
172	3.115265	0
173	0	0
174	2.645065	0
175	3.333333	3.333333
176	3.75075	0

	A	B	C	D	E	F	G
177	O93	Version 1	Owner	Chemical M	Add-on	Private	CR
178	O94	Version 1	Owner	Chemical M	Grass Roo	Private	CR
179	O95	Version 1	Owner	Chemical M	Modernizat	Private	CR
180	O96	Version 1	Owner	Water/Was	Grass Roo	Private	CR
181	O97	Version 1	Owner	Chemical M	Grass Roo	Private	CR
182	O98	Version 1	Owner	Lowrise Of	Grass Roo	Private	GP
183	O99	Version 1	Owner	Microelectr	Grass Roo	Private	CR

	H	I	J	K	L	M	N
177	No	5116000	5943000	827000	16.16497	3/13/95	12/15/95
178	No	2144000	1922000	-222000	-10.35448	5/1/95	12/21/95
179	No	4700000	8000000	3300000	70.21277	1/24/95	12/28/95
180	No	1283000	1789000	506000	39.43882	2/15/95	12/29/95
181	No	-999	-999	0	0	9/1/92	12/31/93
182	Yes	-999	-999	0	0	9/9/09	9/9/09
183	Yes	-999	-999	0	0	9/9/09	9/9/09

	O	P	Q	R	S	T	U
177	3/20/95	4/12/96	25	7.5	96344	1	0
178	5/15/95	12/31/95	0	5.5	67066	0	0
179	12/19/94	2/9/96	20	9.5	320000	6	0
180	4/10/95	3/28/96	5	10	-999	-999	-999
181	9/1/92	12/31/93	76	7.5	640300	6	0
182	9/9/09	9/9/09	-999	6	587000	6	0
183	9/9/09	9/9/09	-999	8	3595212	103	9

	V	W
177	2.075895	0
178	0	0
179	3.75	0
180	200000	200000
181	1.874122	0
182	2.044293	0
183	5.729843	0.500666

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Vita

John Joseph Nesius was born in Mankato, Minnesota on April 15, 1963, the son of Hilda Andrea (Honey) Nesius and Leo Anthony Nesius. Upon completion of work at Cypress Lakes High School in Fort Myers, Florida, he entered the University of Minnesota at Minneapolis, Minnesota, where he received the degree of Bachelor of Civil Engineering. In May of 1986 he entered the United States Navy Civil Engineer Corps and has served at various duty stations around the world. He currently holds the rank of Lieutenant Commander. In August of 1997 he entered The Graduate School at The University of Texas under the Navy Graduate Program.

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